DOCUMENT RESUME

ED 176 496 EC 120 571

AUTHOR Gaylord-Ross, Robert J.
TITLE The Development of Treatment Techniques for the Remediation of Self-Injurious Behavior in the Classroom and Home. Final Report.
INSTITUTION Yeshiva Univ., New York, N.Y.
SPONS AGENCY Bureau of Education for the Handicapped (DHEW/OE), Washington, D.C.
BUREAU NO 443CH70586
PUB DATE Apr 79
GRANT G007603954
NOTE 131p.

EDRS PRICE MF01/PC06 Plus Postage.
DESCRIPTORS *Behavior Change; Behavior Patterns; Contingency Management; Exceptional Child Research; Negative Reinforcement; *Operant Conditioning; *Performance Factors; Positive Reinforcement; *Self Mutilation; *Severely Handicapped

ABSTRACT

Four treatment procedures were evaluated for effectiveness in reducing self injurious behavior (SIB) of 22 severely handicapped students. Treatment procedures included contingent restraint, reinforcement withdrawal, differential reinforcement of incompatible behavior, and omission training (rewarding the S for not emitting the SIB response). Results indicated the superiority of the contingent restraint (CR) procedure. CR was the only technique using a contingent application of an aversive stimulus. A theoretical analysis considered implications for treatment of SIB from positive and negative reinforcement interpretations. Three recommendations for treatment were made: the child should be programmed in a social and educational interaction as much as possible; educational materials and instructional commands should be programmed in a graduated fashion allowing aversive materials and commands to be avoided at first; and efforts should be made to identify maximally reinforcing stimuli. Cooperating teachers and parents were shown to be able to implement behavior modification techniques to reduce SIB. In a second study, SIB was found to be correlated with the type of task engaged in by a 16 year old severely retarded female. A third study demonstrated a relationship between task difficulty and aberrant behavior. Among appendixes are sample consent forms and data sheets, and three related papers: "An Analysis of Antecedent, Response, and Consequence Events in the Treatment of Self Injurious Behavior," "A Decision Model for the Treatment of Aberrant Behavior in Applied Settings," and "The Relationship Between Task Difficulty and Inappropriate Behavior in Severely Retarded Children." (CL)

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ED176496

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Dr. Robert J. Gaylord-Ross

Yeshiva University

New York, New York 10003

April, 1979

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

E 170571

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Education for the Handicapped

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Dr. Robert Gaylord-Ross
Special Education Department
Yeshiva University
55 Fifth Avenue
New York, New York 10003

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INTRODUCTION

Statement of the Problem

Self-injurious behavior (SIB) is an extreme form of psychopathological behavior appearing among a number of severely handicapped individuals. Definitionally, SIB involves repeated and chronic, self-inflicted responses where potential or real tissue damage may occur. The types of self-mutilitative responses frequently observed are head-banging, face-slapping, self-biting, hair-pulling, and scratching. Thus, SIB differs from suicidal acts of self-destruction in that it is not episodic and it is rarely fatal.

SIB poses two critical problems for the individual. First, it obviously is threatening to the physical health of the person. Besides cuts, bruises, and infections that may result, some cases have been reported where there has been a loss of sight and excision of parts of the body, e.g., biting away part of the lip. In addition, when the individual is preoccupied with SIB there is little chance that substantive learning will take place. Therefore, the person reamins at a rather low level of human development. As will be seen below, one treatment strategy is to increase the number of skills in a person's repertoire so that the emission of constructive responses will compete with SIB. Any truly effective treatment would simultaneously accelerate constructive responses as well as decellerate the frequency of SIB.

The importance of finding treatment techniques that can reduce or eliminate self-injury can be viewed in another light. In the past, the appearance of SIB or other severe aberrant behaviors has led to the institutionalization of many handicapped persons. Given the current national trend of deinstitutionalization, it will be important that many aberrant behaviors like SIB can be reduced to reasonable levels so that successful community adjustment can take place. It is one of the objectives of the present project to develop effective treatment procedures to reduce SIB in a community-based context, i.e., the school and the home of the child.

Although a number of theoretical views have been advanced to analyze the etiology of SIB, e.g. psychoanalysis, the operant or behavior modification approach has produced nearly all of the published treatment efforts to eliminate this syndrome (Carr, 1977; Bachman, 1972). The operant approaches have typically tried to manipulate specific consequating events so that either the SIB is punished or some alternative behavior is positively reinforced. Reported studies have typically been of the case study variety where a single treatment approach is shown to successfully suppress the SIB. There has been a noticeable absence of studies that compare the differential treatment effectiveness of a number of techniques with a larger group of clients. To this end, the present study is committed.

Purpose and Objectives of the Project

The major purpose of the project is to determine whether there is a

a single, most effective treatment procedure for reducing SIB. The project makes this determination by exposing a number of students with SIB to four treatment procedures. Each of these procedures has been shown to be effective in previously-published studies. To the author's knowledge, though, there has been no differential comparison of these procedures across a sizeable sample of subjects. The study successively exposed each subject to the four treatment procedures to examine their relative effectiveness.

In addition to determining differential treatment effectiveness in a controlled experimental setting, the project worked with the student's parents and teacher to investigate their ability to decellerate SIB. Parents and teachers were trained in behavioral recording and treatment techniques and their ability to decrease SIB was experimentally evaluated.

Besides the basic group design project, a number of other experimental investigations were carried out to analyze a number of controlling variables on SIB. A single-subject designed study was completed that investigated the relationship between task preferences and SIB. A second set of studies were carried out that explored the effect of task difficulty and errorless learning on aberrant behavior.

Finally, a paper was developed that summarized the principal investigator's (PI's) views on aberrant behavior. The paper presents a decision model that advances a step-by-step approach that practitioners should take when dealing with aberrant behaviors. The decision model emphasizes skill building approaches as an alternative to the hasty use of punishment. Data is presented in the Results section which demonstrates the correlation between skill building (the mastery of instructional objectives) and the reduction of SIB.

Thus, the project attempted to generate a number of empirical and conceptual findings that should advance our knowledge of the treatment of aberrant behavior. A series of studies were conducted in the classroom and home settings to investigate a number of treatment variables that directly affect the rate of SIB. The procedures, results, and conclusions of these studies are presented below.

PROJECT STAFF

The project staff was primarily recruited from graduate students attending Yeshiva University. The staff positions consisted of principal investigator, project director, trainers, and secretary. The field-based nature of the project had staff members dispersed in many sites in the New York City area. Although there was some turnover in staff, the staff displayed a great deal of competency and commitment in carrying out the project goals. In this regard, favorable feedback was received from school administrators about staff performance. The actual names of staff persons are given in the Acknowledgements section.

IDENTIFICATION OF SUBJECTS

It has been estimated that there are between .2% and .9% of the general population that are severely handicapped. Within this low incidence, handicapping condition there is a subgroup of self-injurious persons. Estimates of self-injurious persons vary. A recent study by Schroeder and Humphrey (1977) reported that 10% of an institutional population that was almost exclusively severely/profoundly retarded, was self-abusive. Other estimates of self-injurious persons in similar institutional populations have varied but they typically range between the 10%-20% mark. While no similar epidemiological studies have been done with community-based samples, it could be predicted that there would be a lower incidence of this type of syndrome with noninstitutionalized groups. This prediction is based on the fact that extreme behavior pathologies like self-injury have often been the cause of institutional placement. Secondly, it is likely that the environmentally deprived conditions existing on many back wards that appear to lead to extreme forms of aberrant behavior would not be present in community settings. In either case, a rather small target population is designated when the sample is limited to noninstitutionalized persons that are chronically self-abusive. Since the project attempted to work with approximately 20-30 self-injurious children over the two-year funding period, a sample of this size could probably only be identified in a large metropolitan area like New York City.

The strategy for obtaining subjects was for the Principal Investigator (PI) to make phone calls to the directors or principals of schools in the New York City area that served severely handicapped children, e.g., severely/profoundly retarded, autistic, neurologically impaired. Though a number of schools were willing to cooperate with the project, upon closer examination, they failed to have children that were chronically self-abusive. If the school administrator and staff indicated they were interested in collaborating, they were sent a copy of the proposal. The PI then visited the school, met with the staff, and observed particular children. A decision rule was made that at least two children at the school had to be chronically self-injurious. Ideally, the trainer (TR, a half-time research assistant affiliated with the project) would work with three children at one time. A minimum of two children was required, though, to make the collaboration cost-effective in terms of collecting data of the stated number of subjects, with the given number of staff, and within the two year funding period.

Given this procedure, five schools were initially identified to be affiliated with the project. They were:

1. The Bernard Fineson Development Center, Queens, New York,
2. The Association for Blind and Retarded Children, Queens, New York,
3. The Brooklyn School for Special Children, Brooklyn, New York,
4. The Onondaga Association for Retarded Citizens School, Syracuse, New York,
5. The United Cerebral Palsy School, Brooklyn, New York.

All of the schools had day programs serving students predominantly from noninstitutional settings. A total of 25 students were identified to

participate in the project. Three subjects were dropped from the project because they displayed little self-injury on a daily basis. Thus, the actual sample consisted of 22 students that completed the group design project. One of these students also served as a subject in the task preference study.

A second sample of seven students was used in the task difficulty study. These subjects attended the Nassau School for the Emotionally Disturbed, Long Island, New York. They had been diagnosed as autistic or severely mentally retarded and displayed some chronic aberrant behavior. The aberrant behavior was outward aggression, self-injury, or self-stimulation.

Before sessions began a signed letter of permission was obtained from the student's parent or guardian (see Appendix A). Of course, besides permitting their child to participate, parents (and teachers) had to agree to collaborate with the project.

START-UP AND OPERATIONS

After subjects and school sites were successfully identified, the TRs were assigned to a particular school on a daily basis. The PI initially trained the TRs in correct procedures and methodology. Then, the TRs instructed the cooperating teachers (TCs) and parents (PRs) in these procedures (see Appendix A for recording instructions). The TRs thereafter had: daily half-hour treatment sessions with the child, consulted with TCs on technique and measurement matters, and made similar consultations in the homes of the children. The TR ran a number of preliminary observation sessions to see if the targeted children had sufficient frequency counts of SIB to warrant further treatment.

The project began after training was completed, written permission was obtained, and the child was empirically validated to be self-injurious. The TR, TC, and PR simultaneously began recording sessions on the same day. In this multiple baseline design, the TR, TC, and PR ran half-hour observation sessions at the same time each day. The TR and TC sessions were held in the child's classroom and the PR sessions were in the home. Sessions were not to be held when the child was eating or sleeping. During Phase 1, when PRs and TCs were solely doing baseline recording, they were told not to interrupt their normal activities. They were only to make sure that the child was in their line of vision throughout the entire half-hour session. Three materials were given and explained to the TC and PR. They were the recording sheet (Appendix A), a golf counter, and a kitchen timer. They were told to set the time at 30 minutes, record the number of self-injurious responses on the golf counter, and when the session ended, make written entries of the response frequency on the recording sheet. The TR collected the recording sheets and did reliability checks on a weekly basis. The accumulating data were entered on the consolidated recording sheet (Appendix A) by the TR. Consolidated data sheets were photoduplicated and subjected to graphical and statistical analysis.

Secondary Measures

Besides the primary data collected on SIB, there was a good deal of secondary data collected. A number of characteristics about the subject were obtained from the Comprehensive Data Sheet (Appendix A). Such information included age, primary diagnostic classification, length of appearance of SIB, etc. Another measure was the Progress Assessment Chart (PAC) (Gunzberg, 1973). The PAC is an index of adaptive behavior that was administered on a pre- and post-basis. Scores were obtained on a number of functional domains like self-care, communication, gross motor, fine motor, and socialization. Also, the HOME inventory (Caldwell, 1967) was administered to give an index of environmental enrichment in the domicile of the child. The PAC was filled out by the TC. On items the TC was unable to answer, the assistance of the PR was sought. The HOME was filled out by the TR based on a particular visit to the domicile of the child. A copy of the HOME is included in Appendix B.

The secondary measures were collected to investigate the relationships among self-injury, adaptive behavior, and environmental stimulation. It was

suspected among persons with higher rates of self-injury that there would be lower adaptive behavior levels and less stimulation in the home. Similarly, students showing the greatest reductions in SIB should evidence the greatest improvements in adaptive behavior.

DESIGN AND TREATMENT PROCEDURES

Design

The group study was designed to have two phases. In Phase 1 the TR would expose the child to four treatment procedures. During this time the TC and PR would take ongoing baseline recordings without an actual treatment intervention. The logic behind this multiple baseline design was to detect the most effective treatment for the individual and the overall sample during the TR sessions. The baseline sessions with TC and PR were to measure generalization of treatment effects from TR sessions. After Phase 1 was completed, a second phase was to begin. In Phase 2 the TC and PR would successively apply the technique that had been most successful in Phase 1 for the individual. Phase 2 also followed a multiple baseline design as the particular treatment was successfully lagged in across TC and PR.

In Phase 1 the subject was initially exposed to five treatment sessions of Baseline 1 (B1). B1 consisted of the TR observing the child from a distance in the actual classroom. The child participated in normal classroom activities and there was no interaction between TR and child. Baseline 2 (B2) always immediately followed B1. B2 consisted of five sessions where the TR engaged the child in 1:1 interaction on a particular educational task. In B2 there was no positive or negative consequation of educational of self-injurious responses. The TR tried to keep the child on task without applying any systematic reinforcement or punishment procedure. In this way, SIB during B1 could be contrasted to SIB in B2 to show the effects of 1:1 interaction on the reduction of self-injury. If one moved directly from B1 to a particular treatment procedure, there would be a confounding of reinforcement schedule with the type of interaction.

After both baseline conditions were completed the child was successively exposed to four treatment conditions. These particular conditions were selected because of their past success in decreasing self-injury. Each condition was run for 10 consecutive sessions. The order of treatment presentation was varied across subjects with a Latin Square procedure. The four possible orders were:

1. DRI-OT-CR-RW
2. OT-DRI-RW-CR
3. CR-RW-DRI-OT
4. RW-CR-OT-DRI

DRI=Differential Reinforcement of Incompatible Behavior
OT=Omission Training
RW=Reinforcement Withdrawal
CR=Contingent Restraint

Treatment Procedures

Contingent restraint. During CR sessions if the child emitted a self-injurious response the TR would immediately apply the CR procedure. CR consisted of the TR first giving the verbal command "hands down." The TR would immediately take the child's hand and hold it at his/her side for a fixed, one minute period. All of the subjects in this study were using their hands as some part of the self-abuse, i.e., head-slapping, hand-biting, etc. If there had been head banging, i.e., head to object

movement, CR would entail head restraint in a particular position.

The CR procedure was applied in a systematic, contingent manner. If the child emitted SIBs with the other hand when one hand was restrained, CR would then involve the restraint of both hands. The TRs were instructed to use the minimal amount of manual force in order to make the child hold his/her hands in the downward position. In one case, in fact, all that was eventually needed was the verbal command "hands down" and the child placed her hands down without any manual prompt. During CR the TR recorded the number of CR periods in a session.

Reinforcement withdrawal. The other procedure (besides CR) that uses contingent punishment is RW. RW involves the contingent removal of a positive or rewarding event. In this case it is hypothesized that the social attention given to SIB by the child's caretakes may inadvertently reinforce and maintain the behavior. This may occur in the context of the caretaker trying to reassure the child or prevent the child from emitting any further responses. In this study RW required that the TR move away fromthe subject contingent upon a self-injurious response. The TR ceased interaction with the child and moved approximately 15 feet away from the child. The TR's back was partially turned away from the child to further indicate the cessation of interaction. The TR still had to be looking at the child during this one minute period so that accurate recordings could be made. The problem never arose that the child pursued the TR. At the end of the one minute period the TR returned to the child and resumed on task interaction. No verbalizations were made by the TR throughout the RW procedure.

Differential reinforcement of incompatible behavior. There were two procedures involving positive consequation. The DRI procedure entailed the classical, Skinnerian, positive reinforcement approach. That is, every correct, on task response by the subject received immediate positive consequation. This response-consequation procedure was carried out on a continuous reinforcement schedule. In this way alternative, constructive behaviors were positively consequated in the hope that their frequency would increase while the SIB would concomitantly decrease.

It should be added that the actual task that was engaged during the TR sessions varied from subject to subject. Also, the reward or positive consequence varied across subjects. Verbal praise, though, was always paired with a positive consequence like food, physical caressing and rocking, or object manipulation. Contingent verbal praise was also applied in the other conditions (including B2), unless it was shown to be the most potent reinforcer for DRI. The actual reward was determined on an individual basis through pre-treatment exploration.

Omission training. The second procedure using positive consequation is OT or the differential reinforcement of other behavior. In OT, the subject is rewarded for not emitting the aberrant (self-injurious) response. Initially, the length of the OT interval was set at the inverse of the rate of the SIB. That is, if the child was emitting SIB at the rate of two responses per minute, the OT interval would be set at 30 seconds. As the rate of self-injury decreased, the length of the OT interval gradually increased. The OT interval would typically be increased in steps from:

30 secs., 40 secs., 50 secs., one minute, one min. and 30 secs., two min., three min., four min., five min., etc. There was a specific decision rule to determine when the OT interval would be increased. When the subject had gone five straight OT intervals without a self-injurious response, the interval length was increased. This procedure continued throughout the OT condition.

Mastery of Behavioral Objectives

During the second project year, there was a more careful monitoring of pupil progress on the specific instructional tasks. That is, a behavioral objective was set for each student in the study. During the TR sessions the student would work toward attaining the objective. Furthermore, the overall objective was task analyzed into sub-objectives that would be successively taught. A tally was then made on the number of sub-objectives mastered during each treatment condition. A correlation would then be calculated between the reduction in SIB and the number of objectives mastered. It was predicted that a significant, positive relationship would be found.

RESULTS

Primary Measures

Phase 1. The Phase 1 data was separately analyzed for group and individual trends. First, an indication of the treatment effects in the TR condition is reported. The means and standard deviations for the 22 subjects are presented in Table 1. It is evident that the largest amount of SIB appeared in the B1 condition. There was a noticeable reduction in self-injury, though, from B1 to B2. Apparently the initiation of 1:1 interaction reduced the emission of self-abusive responses considerably. Overall, RW was the least effective treatment procedure. OT was the second least effective technique, DRI third and CR was clearly the most effective procedure.

It should be explained that a specific correction formula was applied to compute the SIB frequency during CR. The correction formula was used in order to prevent a spuriously low score being obtained during CR. This effect could result from the fact that during CR the subject was being contingently restrained for a fixed one minute period. During this time it was impossible for the subject to respond. Thus, for some subjects that were emitting SIBs at high rates, they could be restrained for vitually the whole half-hour session. Thus, a formula to prorate self-injurious responding was calculated. The formula was:

$$\frac{30 \times \#SIBs}{30 - \#SIBs}$$

The formula essentially calculated the rate (per minute) of self-injury during the unrestrained time, #SIB/(30 - #SIB), and prorated this score over the full 30 minute session.

A one-way, repeated measures, analysis of variance (ANOVA) was computed on the TR data in Phase 1. That is, the mean score for each subject in each treatment condition was the unit of measure. A reliable difference among the six treatment conditions was found, $F\ (5, 105) = 6.52$, $p < .01$. A Newman-Keuls post hoc analysis was calculated on the six treatment means. Table 1 shows the pairwise comparisons between means. The two outcomes of this analysis were: (a) B1 was significantly larger than all of the treatment conditions except B2, and (b) CR was significantly less than B2. An ANOVA was also calculated on the effect of order of presentation of the four treatment conditions. No significant differences were found.

A similar one-way, repeated measures ANOVA was calculated on the Phase 1 treatment means for the TC and PR data. There were no reliable (significant) effects found for the TC and PR data. This would indicate that there was no significant generalization of treatment effects from the TR to the TC and PR settings.

Next, an analysis of individual subjects was carried out. Table 2 presents the type of self-injury appearing for the 22 subjects. There were

TABLE 1

Treatment Condition Means and Standard Deviations in Phase 1 for Trainer, Teacher, and Parent Settings

Treatment	B1	B2	RW	OT	DRI	CR
			Trainer			
Mean[2]	168.4	124.5	102.3	76.1	68.3	41.4
Standard Deviation	189.8	160.2	164.9	84.1	104.0	53.5
			Teacher			
Mean	82.5	71.1	40.6	59.6	41.0	33.4
Standard Deviation	110.8	99.6	56.3	92.1	67.6	48.8
			Parent			
Mean	141.1	87.7	47.6	61.8	74.3	50.4
Standard Deviation	177.7	92.3	49.1	64.0	85.0	59.6

[1]Treatment abbreviations: B1=Baseline 1, B2=Baseline 2, RW=Reinforcement Withdrawal, OT=Omission Training, DRI=Differential Reinforcement of Incompatible Behavior, CR=Contingent Restraint.

[2]Newman-Keuls post hoc analysis of Trainer treatment means. Conditions with common underline are not significantly different from each other.

OT, DRI, and CR were significantly different from B1 at the .01 level. RW differed from B1 and CR differed from B2 at the .05 level of significance.

TABLE 2

Individual Data for Type of SIB, Most Effective Treatment, and Percent Reduction

Student	Most Effective Treatment[1]	BI	% Reduction
TC	RW 1.8	23.4	92.3
WD	CR 23.3	133.7	82.6
JW	DRI 1.0	7.6	85.7
LR	DRI 0 RW 0	130.0	100.0
MF	CR 6.8	161.0	95.8
RN	CR 104.3	301.2	65.0
MC	RW 57.5	583.4	90.1
BP	DRI 1.8	25.8	93.0
BS	RW 2.2	49.2	95.6
RC	RW 127.5	562.0	100.0
TG	CR 28.9	132.0	78.1
KS	DRI 101.8	78.4	30.0
JA	CR 10.8	25.0	56.8
HZ	CR 1.6	365.4	100.0
JT	DRI 35.2	85.2	58.7
RL	RW 6.6	308.2	97.9
WM	CR 82.3	129.2	36.3
PR	CR 3.3	15.0	78.8
MS	B2 3.2	1.4	0.0
GS	OT 2.5	18.0	86.1
NC	CR 161.5	539.6	70.1
BZ	CR 72.8	29.8	90.6
Mean	34.9	168.4	73.8
Median	6.7	107.2	85.9

[1]B1=Baseline 1, B2=Baseline 2,
RW=Reinforcement Withdrawal, OT=Omission Training,
DRI=Differential Reinforcement of Incompatible Behavior,
CR=Contingent Restraint

two general types of responses: self-biting of the hands and arms, and body punching, primarily to the head area. Table 2 shows the mean score in B1 for each subject and the mean score for the most effective treatment condition. The percent reduction in SIB is calculated in the last column. First, it is evident that there was a considerable reduction (mean=73.8%) from B1 to the most effective treatment. Of the 22 subjects, 19 showed greater than 50% reduction in SIB. Furthermore, a one-way, repeated measures ANOVA was calculated between B1 and the most effective treatment condition. A significant difference between conditions resulted, $F(1, 20) = 8.1$, $p < .01$. A tabulation of the most effective treatment conditions indicated that the respective frequencies were: CR=10, RW=6, DRI=5, OT=1. The differences among the frequencies was statistically significant, $\underline{X}^2(3)=9.2$, $p < .01$. The frequency data cross-validates the parametric data and supports the superiority of CR. RW appeared to be more effective in the frequency analysis. Apparently for a subsample of six students TW was quite effective. For the remainder of the sample, though, RW was the least effective treatment procedure.

An analysis of trends of the Phase 1 TR data was performed on 15 subjects. Calculating treatment effects solely through visual inspection and means analysis can be a limited approach because it fails to account for data trends within the particular treatment conditions. For this reason, the "quarter intersect" method (White and Liberty, 1971) of trend analysis was completed on all of the Phase 1 treatment conditions. Slopes were plotted for each of the six conditions.

A summary of the trend data is tabulated in Table 3. An upward trend for a treatment condition was indicated when the slope celeration line exceeded x2.0. A downward trend was scored when the slope celeration line exceeded ÷2.0. A horizontal trend had celeration slope lines ranging between ÷2.0 and x2.0.

Table 3 shows that, overall, there was a relatively equal number of downward, upward, and horizontal trends across treatment conditions, $\underline{X}^2(2)=2.0$, ns. For the most effective treatment procedures, though, there were significantly more horizontal trends in the data set, i.e., upward = 4, downward = 0, and horizontal = 11, $\underline{X}^2(2) = 12.4$, $p < .01$. Thus, the most effective treatment procedures exhibited a plateau of aymptotic trend across the treatment sessions. This was particularly true for the most effective procedure, CR, where six of the seven data sets had horizontal trends.

Phase 2. Phase 2 data was analyzed for nine subjects. The actual treatment procedures applied in Phase 2 differed for each subject. Often conjunctive schedules of reinforcement were used where a procedure like CR was combined with DRI. That is, when a correct on-task response was emitted there was positive consequation. When SIB occurred the student was contingently restrained. Thus, both procedures were alternated during a session.

Six of the nine subjects received treatment in both the TC and PR conditions. The three remaining children received treatment in only one condition because: (1) there was zero SIB in the home (JA), (b) reliable treatment methodology could not be obtained in the home due to language,

TABLE 3

Frequency[1] of Types of Trends in Phase 1 Data

Trend	B1[2]	B2	DRI	OT	CR	RW	TOTAL
Upward	6	5	2	2(1)	5(1)	5(1)	25(4)
Horizontal	3(1)	3	9(2)	9	6(6)	6(3)	36(11)
Downward	6	7	4	4	4	4	29(0)

[1]Numbers in parentheses indicate frequency of trend for the most effective treatment conditions.

[2]Treatment abbreviations: B1-Baseline 1, B2=Baseline 2, RW=Reinforcement Withdrawal, OT=Omission Training, DRI=Differential Reinforcement of Incompatible Behavior, CR=Contingent Restraint.

TABLE 4

Frequency of Successful and Unsuccessful Interventions with Teachers and Parents in Phase 2

Outcome	Intervention Agent	
	Parents	Teachers
Successful	3	5
Unsuccessful	5	2

geographical, and time factors (GS), and (c) SIB was never successfully reduced in the PR setting, which precluded its introduction in the TC setting (WM).

The multiple baseline graphs indicated significant differences between baseline and treatment conditions in seven of the nine subjects. Table 4 tabulates the specific number of successes and failures of treatment in the TC and PR settings. Failure was defined as no noticeable shift from baseline with respect to level (mean) or trend measures. It is evident that the TCs were more successful than the PRs in reducing SIB.

Secondary Measures

Table 5 presents the means and standard deviations of the secondary measures: PAC-pretest, PAC-postttest, and the HOME. There was a statistically significant difference between PAC pretest and posttest, F (1, 16)=9.2, $p < .01$. Thus, over the project year there was a general improvement in adaptive behavior in the project sample.

Intercorrelation coefficients (Pearson r s) were calculated among five variables:

1. PAC-pretest.
2. ΔPAC (change in PAC=PAC-posttest—PAC-pretest).
3. HOME.
4. SIB-baseline 1.
5. ΔSIB (change in SIB=SIB-most effective treatment mean—SIB-baseline 1).

None of the correlation coefficients attained statistical significance.

TABLE 5

Means and Standard Deviations of the Secondary Measures

	PAC Pretest	PAC Posttest	HOME
Mean	48.4	62.5	3.5
Standard Deviation	20.5	24.4	1.7

Behavioral Objectives Mastered

The relationship between the number of behavioral objectives mastered in each treatment condition/mean percent reduction in SIB per treatment and condition was investigated in a number of ways. First, the mean number of

objectives mastered per condition was 1.77. Thus, over the five conditions (B2 plus the four treatments) each student was mastering on the average, 8.86 objectives. The mean percent reduction in SIB per condition (in comparison to B1) was 42.0%. The correlation between objectives mastered and SIB reduction was marginally significant, r (33)=.32, $p < .10$. A multiple regression analysis was performed in order to detail the relationship between point-by-point correspondences in these variables. The regression formula was: $y = 5.68x + 31.9$, where x is the number of objectives and y is SIB reduction. It can be seen that when zero objectives are mastered there will be a 32% reduction in SIB. The other point-by-point predictions were: 1=38%, 2=43%, 3=49%, 5=60%, 10=89%, 12=100%. Thus, 12 objectives would have to be mastered to get a 100% reduction in SIB.

DISCUSSION

The most striking effect of the data was the effectiveness of the CR procedure. This superiority was reflected in both the group and individual analysis of the data. An attempt will be made in this section to give a more conceptual and theoretical account of the CR and the other results of the project.

In attempting to analyze the critical components of CR there appears to be two important factors. For one, CR is the only technique where an aversive stimulus is contingently applied. There are a number of studies demonstrating the efficaciousness of punishment in suppressing aberrant behavior with severely handicapped children. In these studies the degree or intensity of punishment has varied. At one extreme, Lovaas and Simmons (1969) have applied electric shock. Studies using contingent electric shock or other strong aversive stimuli like aromatic ammonia have often shown rather abrupt and complete suppression of the aberrant behavior (Baumeister & Forehand, 1976). When leaving the bounds of intensive aversive stimuli, the next most aversive procedure would be overcorrection as defined by Foxx and Azrin (1973). This technique entails the manual control over a client's behavior as he/she is put through a regime of calisthenic-like exercises. Besides the degree of manual guidance involved, overcorrection often has a 5-20 minute duration. In this sense the procedure referred to in the present project as CR is not truly overcorrection. Contingent restraint (cf. Schroeder & Humphrey, 1977) entails holding a body part like the arm in a fixed position. In the present study it lasted for one minute. Contingent restraint can thus be viewed as a less punishing stimulus than overcorrection because of its shorter duration and because of the absence of guided physical movement. It is similar to overcorrection in that it involves a verbal command and manual guidance with fading. At the least intense level of punishment would be a quick slap or movement of the hands down accompanied by a verbal command "no" or "hands down." This quick procedure has been shown to reduce self stimulatory behavior by Koegel and Covert (1977). This must be viewed as the least punishing stimulus because of its short duration and minimal manual guidance.

The second important component of both overcorrection and contingent restraint is the counter-control obtained over the subject's behavior. Assuming that SIB can be used as a manipulative tactic, CR was the only procedure in this project where the TR physically intervenes to control the expression of the subject's behavior. Of course, this counter-control function could operate as a punishing stimulus and thus be viewed as equivalent to other punishment procedures. I would choose to make the distinction that in addition to having this punishing characteristic, CR also exerts a counter-controlling function that operates above and beyond punishment. This counter-controlling function will be analyzed in more theoretical detail below.

Theoretical Analysis

E. Carr (1977) has recently outlined the two major operant mechanisms

that can maintain SIB. The mechanisms are positive reinforcement and negative reinforcement. When positive reinforcement is operative there is continuous or intermittent positive consequation of self-injurious responses. The type of positive consequation is typically social attention by the child's immediate caretaker.

Most important for the present discussion are the implications for treatment from such a positive and negative reinforcement analysis. In the case of positive reinforcement it would seem that treatment techniques that broke the response-social reinforcer bond should reduce SIB. One would expect such a reduction because of extinction. An extinction program would have direct care personnel ignore the SIB. One problem with extinction in natural settings is that an individual may inadvertantly reinforce a self-injurious response. Such an action would place the child on an intermittent schedule of reinforcement. Intermittent schedules maintain high and durable response rates. Therefore, a more active and systematic approach to extinguish SIB may be warranted. A total extinction approach reported by Jones, Simmons, and Frankel (1974) involved placing the person in complete isolation for long (six hour) periods of time. In this way there was no possible chance for social contingencies to occur. Another type of isolation procedure is timeout. In timeout, contingent upon a particular aberrant response, the subject is removed for a fixed period of time to an isolated area or room. Timeout removes the person from contact from all positive reinforcers but may also involve intense physical struggles with larger clients, and may thus inadvertantly reinforce the behavior through such physical contact. RW tries to extinguish a particular behavior by contingently removing a specific positive consequence. Tokens or social interactions (as in the present project) are contingently removed after the emission of a response. In RW, though, the clinician or experimentor is making a stronger hypothesis that a particular stimulus is in fact reinforcing and maintaining the SIB. Timout, in contrast, removes all possible reinforcers.

Interestingly, RW was the least effective technique in the group analysis of the results. But in the individual analysis RW was the most effective technique for six subjects. It is argued here that RW did not reduce SIB in these clients because of the extinction of positive (social) reinforcement. Rather, as will be argued below, SIB had been maintained by a negative reinforcement paradigm. RW, then, reduced SIB because of its imposition on the negative reinforcement schedule.

Before discussing negative reinforcement, though, the relationship between positive reinforcement and techniques emphasizing positive consequation should be addressed. In the present study DRI was applied under the assumption that alternative, constructive behaviors would be strengthened and compete with SIB. The DRI procedure has the advantage that alternative behaviors can be prompted and reinforced so that it is unlikely that the person will emit SIBs at the same time that alternative responses are produced. One problem with this logic that appeared in some actual cases in the study was that SIB could alternate on a second-to-second basis with the production of task responses. The question of whether severely handicapped children can make substantive gains in learning before aberrant behaviors have been suppressed has yet to be

resolved. Koegel and Covert (1972) found substantive improvements in discrimination learning only after self-stimulatory behaviors were removed with a mild punishment technique. Certainly the effectiveness of CR in the present study is supportive of the Koegal and Covert finding. Since the post hoc analysis did not show CR to be significantly different from DRI, a definitive conclusion is not warranted at this juncture.

Probably the most limiting aspect of positive consequation treatment lies in the ability to identify a strong reinforcer. Because of their heterogeneity and low level of functioning, it is not possible to generalize about what are postive consequators for severely handicapped children. Although edibles have often been used, many times they are rejected and not functionally reinforcing to the severely handicapped. I have found that as the severity of the handicap increases, it becomes necessary to use reinforcers that have physical, kinesthetic, vestibular and other sensory reinforcing qualities. In some cases one may never quite find a prepotent incentive. In the one case where minimal reductions in SIB were obtained (WM), it was felt that no reinforcer had been found that could gain stimulus control over the child. Therefore, the unknown reinforcers that are maintaining the SIB remain more potent than the reinforcers being manipulated by the experimentor. If this is the case, it is unlikely that the SIB will be effectively eliminated through positive consequation.

Negative reinforcement. A second schedule that can maintain SIB is negative reinforcement. In this paradigm some negative or aversive event must appear in the milieu of the child. The child then emits a self-injurious response which effectively eliminates the aversive event. Negative reinforcement thus operates as an escape conditioning mechanism, e.g., SIB can prevent the onset or terminate the duration of an aversive event. The maintenance of SIB through negative reinforcement can operate when the aversive events are physical harassment, task demands, or general social interaction. Carr, Newsom, and Binkoff (1976) demonstrated how SIB dramatically increased as a function of verbal mands. In a similar way, Gaylord-Ross, Weeks, and Lipner (in press) showed how SIB could increase as a joint function of verbal commands and a non-preferred task. It has also been my experience in observing children who have been isolated on back wards of institutions to find that social interaction is aversive to them, and subsequently they use SIB or some other aberrant behavior to avoid social interaction.

There are a number of implications from the negative reinforcement paradigm for specific treatment procedures. First, positive procedures like DRI and OT could only have immediate effects if the programmed positive consequators were powerful enough to outweigh the aversive qualities of the social interaction. Since this is often not the case, one could foresee positive approaches gradually reducing the aversiveness of the interaction through systematic reinforcement over long periods of time. In this way, it could be anticipated that antecendent manipulations of verbal instructions and task properties could reduce the aversive quality of the interaction and concomitantly decrease SIB.

Second, a direct punishment procedure like overcorrection or contingent restraint could have an immediate effect upon eliminating SIB. In these punishment procedures manual guidance is maintained over the subject. It thus becomes impossible for the person to use SIB to escape or avoid the interaction with the TR or other caretaker. Therefore, SIB as a manipulation technique to avoid social interaction may quickly extinguish within a few trials due to the failure in avoiding interaction. It is of course possible that the punitive aspects of CR (manual control) may combine with the extinction of negative reinforcement to produce a powerful treatment package.

Third, the effectiveness of RW can be viewed in the context of the negative reinforcement paradigm. In the present project, in RW sessions a self-injurious response led to the TR leaving the immediate area of the child for a one minute period. If the interaction with the TR was aversive for the child, the RW contingency would in fact strengthen the negatively reinforcing properties of SIB by systematically terminating the interaction. For six children this phenomenon appeared to be happening. That is, when the TR worked with the child there was a good bit of collateral emotional behavior indicating the interaction was not pleasant. After SIB occurred the child calmed down while the TR was out of the area. In two cases (MC and JA) the child began to SIB periodically. That is, one self-injurious response was emitted and the TR left the area. During the one minute period no SIB occurred. As soon as the TR returned for interaction the child would immediately emit one SIB. This cyclical pattern continued throughout the therapy session. This cyclical demonstration of SIB in two cases is interesting in a research context but probably of limited educational value. It is unlikely that one would advise a TC to leave the child alone whenever SIB appeared. This is what happened in one case (BS). The teachers left BS alone not only during episodes of SIB, but generally throughout the school day. When such a development occurs, the manipulative powers of aberrant behavior become strongly established through negative reinforcment conditioning.

Treatment and individual differences. The two major interpretations of the maintenance of SIB, positive and negative reinforcement, have been reviewed and integrated with the present data. At present, it would seem that there is more clearcut clinical and research evidence for identifying cases under the control of negative reinforcement. With negative reinforcement the SIB is often accompanied by negative emotional behaviors indicating resistance to the particular interaction. The SIB is used in a manipulative way to escape/avoid such encounters. Positive consequation techniques are often less successful because the reinforcement value of the consequators is not nearly as potent as the aversive value of the interactional stimuli. RW or other isolation techniques like timeout are likely to reduce SIB because the isolation procedure functions to terminate the interaction in a negative reinforcement manner. Overcorrection and other counter-control procedures like contingent restraint may serve to reduce SIB because they prevent the subject from physically escaping the interaction.

Besides identifying a subgroup of persons using SIB in an escape/avoidance manner, no other clear subgroup of self-abusers emerged. One

other major trend did appear in the Phase 1 data. In a consistent manner (group means) SIB was reduced markedly when moving from B1 to B2. Apparently engaging the child in task activity in a one-to-one setting forces him/her to emit alternative behaviors that preclude the simultaneous emission of SIB. Somewhat paradoxically, all of the subjects identified as under the control of negative reinforcement showed this pattern. It is possible that the interaction of B2 engaged them in task activity that precluded simultaneous SIB. At the same time specific aspects of the interaction like instructional demands and task properties may have elicited SIB. This effect was documented in one subject (MC) in a separate report (Gaylord-Ross, Weeks, & Lipner, in press). Certainly, further research is needed to better delineate this pattern of results.

In conclusion, it appears that three recommendations for treatment have emerged from the Phase 1 data. First, the child should be programmed in a social and educational interaction as much as possible. When SIB appears the TCs/aides should continue "working through" on the task so that negative reinforcement does not occur. As a corollary to this recommendation, educational materials and instructional commands should be programmed in a gradated fashion so that aversive materials and commands are initially avoided but gradually faded in over time. Second, a punishment procedure should be contingently applied with the appearance of the SIB. Third, an exacting effort should be made to identify maximally reinforcing stimuli. When maximally reinforcing stimuli are identified and contingently applied to on task responses, the appearance of alternative, constructive behaviors will be greatly enhanced. At the same time, through a response competition notion, the probability of the appearance of SIB will be reduced.

Phase 2

The general results of Phase 2 were promising in that they showed that TCs and PRs are capable of implementing behavior modification techniques to reduce self-injury. Furthermore, seven of the nine subjects demonstrated noticeable reduction in SIB in at least one of the TC/PR conditions. More specifically, TCs showed greater success than PRs in significantly suppressing SIB. The greater success of TCs is probably due to their better training in administering behavioral and other educational techniques. It is also possible that there was greater generalization from the TR (Phase 1) session to the TC intervention (Phase 2) session because of the similarity of the classroom setting. It must be remembered, though, that no significant generalization of SIB reduction occurred in Phase 1 from TR to either TC or PR sessions. This lack of generalization is both discouraging, but to be expected from the principles of operant conditioning (Baer, Wolf, & Risley, 1968). Namely, generalization or transfer of treatment effects should not occur unless they are specifically programmed. The lack of generalization in the present study should also be predicted because of the short therapy sessions. J. Carr (1975) has stated that when one is trying to reduce aberrant behavior a round-the-clock intervention should be instituted. This will increase the chances of completely eliminating the response from the person's repertoire. In contrast, when working to increase skill behaviors, distributed practice sessions, e.g., 20-30 minutes, can be quite

successful. Thus, the present study probably falls short of this criterion of eliminating aberrant behaviors because of the short therapy sessions. Still, severely handicapped children are capable of making discriminations of when therapy contingencies and settings are operative and when they are not in effect (cf. Rollings, 1975). Thus, reliable treatment effect can be expected (and were obtained) within the confines of the treatment setting.

Also, the Phase 2 data demonstrated the potential of combining two schedules of reinforcement conjunctively in order to more effectively reduce SIB. Typically, a punishment procedure like CR was conjunctively paired with a positive procedure like DRI. In this way the beneficial treatment effects of both reward and punishment procedures can be maximized in one treatment package.

Secondary Measures

It was puzzling to find that none of the adaptive behavior, environmental enrichment, or SIB measures intercorrelated to a significant degree. It may be that the present sample represented a rather restricted range of individuals. The mean HOME score, for example, indicated that the group was 1.5 standard deviations below the population norm. Yet, there was a considerable degree of variation in the measures. It may be that the PAC and HOME are somewhat gross measures that should not be expected to correlate with a more precise measure like SIB frequency.

It was shown that adaptive behavior did improve to a significant degree from the beginning to the end of the project. This finding is difficult to interpret as to whether the change was due to a specific treatment procedure, the student's classroom program, or some other extraneous variable. The absence of a control group further hinders clear interpretation.

Behavioral objectives. The relationship found between the number of objectives mastered and SIB reduction is suggestive. It is encouraging to see that as instructional proficiency increases, it is possible to concomitantly reduce aberrant behavior. The issue raised above concerning punishment versus positive reinforcement is not resolved by this data. Even if SIB can be reduced through positive reinforcement procedures alone, it is still possible that a punishment procedure would have a much greater impact alone or in combination with the positive approach. Certainly, the effectiveness of the conjunctive pairing of positive and punishment approaches was supported in the parent and teacher data (Phase 2).

STUDY 2: SELF-INJURY AND TASK PREFERENCES

A second study was conducted during the first project year to investigate the relationship between self-injury and task preferences. The study used a single subject design. The procedure and findings are briefly reviewed in this report. A complete version of the study (Gaylord-Ross, Weeks, & Lipner, in press) is included in the Appendix.

Procedure

A 16-year-old, severely retarded female was the subject under study. She also participated in the group design as MM. She displayed high frequency, hand biting behavior in the classroom and home settings. In the previous study it had been observed that MM emitted SIB under certain task conditions but not when engaging other tasks. The present study attempted to investigate these task x SIB relationships in more detail.

Over a three month period, the subject was exposed to three types of daily subsessions. In one condition (the nonpreferred task) MM sorted different colored buttons. In the preferred task she assembled wooden puzzles. In a third condition the sorting and puzzle tasks were placed in front of MM but no instructional demands were delivered by the trainer. The order of presentation of the three task subconditions was varied each day. In addition, in certain blocks of sessions, correct responses were positively reinforced. During other blocks baseline was in effect and correct responses were not reinforced.

Results

Graphical display of the data clearly indicated that SIB was correlated with the type of task engaged. That is, SIB appeared throughout the sorting subsessions. SIB rarely appeared in the puzzle and no demand conditions. The differential reinforcement of correct responses had little effect on the level of SIB.

The strong covariation between task and SIB has important implications for classroom teachers. It would seem evident that teachers could program tasks that are of higher preference value. Low preference tasks could be avoided so that the general frequency of aberrant behavior is reduced throughout the day. When stimulus control is gained over the aberrant behavior, it may be possible to gradually reintroduce low preference tasks into the instructional regime. Further investigation is certainly needed in this area but the present study certainly points the way for effective classroom interventions.

STUDY 3: TASK DIFFICULTY AND ABERRANT BEHAVIOR

A third study was completed in the second project year. The study was part of Marian Weeks' doctoral dissertation. A brief copy of the study is included in the Appendix and a more complete manuscript is currently in preparation (Weeks, Gaylord-Ross, & Lipner, in preparation).

The study observed a number of severely handicapped students that displayed a variety of aberrant behaviors. An attempt was made to investigate the relationship between task difficulty and aberrant behavior. The findings were replicated across two types of tasks: visual discrimination and self-care. Each subject was exposed to four types of treatment conditions. Baseline presented no tasks or instructional commands. A reversal design was used as baseline conditions were interspersed between the three task conditions. The easy task presented a series of trials where it was expected that few or no errors would occur. The difficult trial-and-error task presented high error, visual discrimination or self-care (perceptual motor) tasks. It was expected and found that many errors appeared on these tasks. The difficult-errorless tasks presented similar, high error tasks that were used in the difficult trial-and-error condition. In this condition, a fading of stimuli procedure was used so that few or no errors occurred during training trials.

The study did not only want to document the presence of errors in the different conditions, but also show their relationship to aberrant behavior. The basic findings were that:

1. Few errors occurred on the easy tasks. Furthermore, basically no aberrant behavior appeared during this condition.

2. Many errors occurred on the difficult trial-and-error tasks. Also, much aberrant behavior appeared during this condition. More specifically, aberrant behavior tended to occur on error trials but not on correct trials. Yet, when criterion performance was reached on a task (few errors), aberrant behavior concomitantly dropped out.

3. On the difficult-errorless tasks, there were few incorrect responses and little aberrant behavior.

4. There was almost no aberrant behavior during baseline conditions.

The consistency of the findings and their replication across persons and tasks was impressive. The results also have important implications for classroom settings. It seems important that teachers design tasks that are at the developmental level of the student. When tasks are too difficult, the child with behavior problems is likely to display aberrant behavior. When difficult tasks must be taught the study showed that it is possible to use fading procedures to slice the tasks into small steps to be mastered. Fine-grained fading (for discrimination tasks) and task analyses (for self-care tasks) appear to be promising techniques for reducing acquisition errors and concomitantly eliminating aberrant behavior.

A DECISION MODEL FOR THE TREATMENT OF ABERRANT BEHAVIOR

Towards the end of the second project year the principal investigator and some of the project staff reflected on the matter of developing a unified approach in treating aberrant behavior. Although the thrust of the funded project had been to discover whether there was one preferred procedure in treating SIB, it became increasingly apparent that the problem was much more complex. A paper was then written that tried to synthesize a number of findings of the project and other research reports. "A Decision Model for the Treatment of Aberrant Behavior in Applied Settings" (copy in Appendix) presents a conceptual model for how practitioners should proceed in treating aberrant behavior.

The model presents five components that must be considered in assessing and treating problem behavior. The components are considered in the sequential order of:

1. Assessment
2. Behavior Analysis
3. Ecology
4. Curriculum
5. Punishment

The practitioner does not implement a treatment for a component unless a component variable, e.g., ecology, appears to be maintaining the problem behavior. Each component contains a series of maintaining variables that might be causal. For each maintenance variable there is a corresponding treatment approach. Thus, the implications for treatment are clear and directly stem from the maintenance variable. The model thus helps teachers and other practitioners decide how to treat a problem behavior(s). The model is certainly more complex than concluding one procedure is superior to all others. The paper has been well received at many sites throughout the country and is currently under review for publication. The model is certainly in need of further empirical validation.

SUMMARY

A two-year research project investigating self-injurious behavior has been completed. The major study investigated the differential effectiveness of four treatment procedures with a sample of 22 severely handicapped, school aged persons. The major finding was that a contingent restraint procedure was most effective in reducing SIB. The other procedures were rank ordered in effectiveness from most to least effective: differential reinforcement of incompatible behavior, omission training, and reinforcement withdrawal. There was significant improvement in adaptive behavior during subject involvement with the project. Teachers and parents were effective in reducing SIB; with teachers demonstrating a greater ability to implement behavioral techniques. Furthermore, the number of instructional objectives mastered in a treatment condition correlated with success in decelerating SIB.

Two substudies were also carried out using single subject design methodology. One study found that preferred tasks were correlated with little SIB, and conversely, nonpreferred tasks produced a high frequency of SIB. The other study found that difficulty tasks produced much aberrant behavior and low error tasks were not associated with this behavior. Furthermore, difficult tasks could be reconstructed through fading procedures. so that errors and aberrant behavior are minimized.

Finally, a paper was written that synthesized much of the work on aberrant behavior. The paper advanced a model that should help practitioners decide how they should proceed when treating aberrant behavior. Five components that should be considered (assessment, behavioral, ecological, curricular, punishment) are described in detail. It is suggested that furture work in this field investigate the functional connections between maintenance and treatment variables.

DISSEMINATION OF FINDINGS

The findings and ideas generated from the project have been disseminated in a number of ways. Papers have been presented at professional meetings. Invited talks have been given at universities and other colloquia-type gatherings. Articles have been accepted or submitted for publication in a variety of professional journals. Also, the project has been publicized in different newspapers.

In the remainder of this section there will be a listing of the various papers, speeches, etc. that have been completed during the two year project. In addition to products directly related to the project, other activities completed by the principal investigator during this two year period are enumerated.

Journal Articles

Gaylord-Ross, R.J. A decision model for the treatment of aberrant behavior in applied settings. Submitted for publication, in press.

Gaylord-Ross, R.J., Weeks, M., & Lipner, C. An analysis of antecedent, response, and consequence events in the treatment of self-injurious behavior. Education and Training of the Mentally Retarded, in press.

Gaylord-Ross, R.J., Weeks, M., Gaylord-Ross, C., & Lipner, C. The differential effectiveness of four treatment procedures in the treatment of self-injurious behavior. In preparation.

Weeks, M. & Gaylord-Ross, R.J. Task difficulty and aberrant behavior in severely handicapped youth. In preparation.

Papers Presented at Professional Meetings

Gaylord-Ross, R.J. The treatment of self-injurious behavior with overcorrection, extinction, omission training, and positive reinforcement procedures. Paper presented at the Gatlinburg Conference on Research in Mental Retardation, Tennessee, March 1977.

Gaylord-Ross, R.J. Self-injury: an analysis of antecedent and consequating events. Paper presented at the convention of the American Association on Mental Deficiency, New Orleans, May 1977.

Gaylord-Ross, R.J. The reduction of aberrant behavior through behavioral interventions. Paper presented at the convention of the American Association for the Education of the Severely/Profoundly Handicapped, San Francisco, October 1977.

Gaylord-Ross, R.J. Self-injury: the differential effectiveness of behavioral treatment procedures. Paper presented at the convention of the American Association on Mental Deficiency, Chicago, June 1976.

Gaylord-Ross, R.J. (moderator) Skill acquisition and aberrant behavior reduction through operant procedures. Panel given at the 102nd annual meeting of the American Association on Mental Deficiency, Denver, May 1978.

Gaylord-Ross, R.J. Mental retardation, ecological validity, and the delivery of longitudinal educational programs. Paper presented at the 102nd annual meeting of the American Association on Mental Deficiency, Denver, May 1978.

Gaylord-Ross, R.J. List structures in task analysis. Paper presented at the convention of the American Association for the Education of the Severely/Profoundly Handicapped, Baltimore, October 1978.

Gaylord-Ross, R.J., Weeks, M., & Gaylord-Ross, C. The differential reduction of aberrant behaviors as a function of reinforcement schedule and skill acquisition. Paper presented at the 102nd annual meeting of the American Association on Mental Deficiency, Denver, May 1978.

Weeks, M. & Gaylord-Ross, R.J. The relationship between task difficulty and inappropriate behavior in severely retarded children. Paper presented at the 102nd annual meeting of the American Association on Mental Deficiency, Denver, May 1978.

Invited Speeches

Gaylord-Ross, R.J. The treatment of problem behaviors in severely handicapped children. Speech given at the Lectures in Child Psychiatry, Albert Einstein Medical College, October 1976.

Gaylord-Ross, R.J. Self-injurious behavior. Speech given at the meeting of the New York State Psychological Association, School Psychology Division, March 1978.

Gaylord-Ross, R.J. Invited speaker and consultant. University of Hawaii, April 1978.

Other Articles, Papers, etc.

Gaylord-Ross, R.J. Mental retardation research, ecological validity, and the delivery of longitudinal educational programs. Journal of Special Education, 1979, in press.

Gaylord-Ross, R.J. Review of Beyond the Ordinary. American Journal of Mental Deficiency, in press.

Gaylord-Ross, R.J. Task analysis and the severely handicapped. In L. Brown, W.S. Sailor, & B. Wilcox (Eds.), New directions in the education of the severely handicapped. Columbus, Ohio: Charles E. Merrill, in press.

Gaylord-Ross, R.J. Problem solving skill in MA- and SES-matched youth. Submitted for publication.

ACKNOWLEDGEMENTS

A number of persons must be thanked for their cooperation and effort in helping the SIB project attain its project goals. First, thanks go to the numerous teachers and parents who extended themselves in such an exemplary way. Their willingness to share information and carry out behavior modification techniques was integral to the various phases of the study. Second, the directors and principals of the respective schools are thanked for their administrative efforts in identifying pupils and coordinating classroom and home efforts. Specifically, thanks go to Chris Weldon at the Association for Blind and Retarded Children, Arlene Perlson at the Brooklyn School for Special Children, Mickey Schechter at the Onondaga Association for Retarded Children, Barbara Siebenburg at the Queens Developmental Center, and Lenny Houseman at the United Cerebral Palsy School (Brooklyn). Third, particular acknowledgements must be paid to staff members that worked so diligently throughout both project years. These persons were Marian Weeks, Carol Lipner, and Cory Gaylord-Ross. Other staff that worked for shorter periods during the project years were: Nancy Adelson, Anita Cole, Marilyn Hirsch, Linda Sandow and Debbie Stern. Fourth, the consultative input of Al Baumeister and Don Dorr-Bremme was especially helpful. The critical comments of Tom Ball, Lou Brown, Fred Frankel, Abe Givner, Robert Koegel, and Harvey Switzsky were also of great assistance.

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APPENDICES

Appendix A: Consent form, Data sheets, and Instructions

Appendix B: HOME Inventory

Appendix C: Manuscripts

APPENDIX A

Consent Form,

Data Sheets,

and

Instructions

YESHIVA SELF-INJURY PROJECT
DR. ROBERT GAYLORD-ROSS

Comprehensive Data Sheet

Subject's Name_____ Age_____
(Years - months at start of project)

Diagnostic Classification_____ IQ (if testable)____

Age when SIB began_____

Rating of parent and teacher as effective recorder and behavior modifier (circle one)

Teacher	1 poor	2 fair	3 good	4 excellent
Parent	1 poor	2 fair	3 good	4 excellent

Response (SIB) definition:

Reinforcer (in OT and PR):

Type of Overcorrection: 1 minute or a few seconds
(circle one)

Educational tasks
(If one or a couple of particular activities were used, describe)

Was SIB periodic during TO? Yes No
(circle one)

Comments about successes and failures of project for the client; either treatment related or other observations (use back of sheet):

YESHIVA SELF-INJURY PROJECT
DR. ROBERT GAYLORD-ROSS

Treatments (Mean Scores)

	B	B1	B2						
Trainer									
Teacher									
Parent									

Reliability

	N	$\bar{X}$	Med
Trainer			
Teacher			
Parent			

PAC

	Pretest (Date:)	Posttest (Date:)
Self-Help		
Communication		
Socialization		
Occupation		
Personality		
Total		

HOME

	Pretest (Date:)		Posttest (Date:)	
	Raw	Stanine	Raw	Stanine
I				
II				
III				
IV				
V				
VI				
Total				

Client_____

Trainer_____

YESHIVA UNIVERSITY - SELF-INJURY PROJECT

Dr. Robert Gaylord-Ross

Consolidated Behavioral Recording Sheet

Condition									
Date									
Trainer									
Teacher									
Parent									

Condition									
Date									
Trainer									
Teacher									
Parent									

Condition									
Date									
Trainer									
Teacher									
Parent									

Condition									
Date									
Trainer									
Teacher									
Parent									

Condition									
Date									
Trainer									
Teacher									
Parent									

Self-Injury Project
Dr. Robert Gaylord-Ross
Special Education Department
Yeshiva University
Parent and Teacher Recording Sheet

Child's Name_____

Recorder_____

Date	Time	Number of Responses	Date	Time	Number of Responses

Self-Injury Project
Dr. Robert Gaylord-Ross
Special Education Department
Yeshiva University

Procedure (Trainer's form)

1. At the first meeting with the parents and teachers explain the general objectives of the research project;
   a. To reduce and eliminate SIB through different treatment procedures (behavior modification)
   b. To involve parents and teachers in the treatment package

2. Explain that parents and teachers will;
   a. operate as recorders throughout the project
      (1) This is to get an index of how frequent the behavior is.
      (2) To assess transfer of treatment effects.

3. Tell them that later into the project they will be asked to provide treatment.

4. Explain the general design:
   a. of 3, ½ hour sessions each school day
   b. They will be asked to record behavior at approximately the same time each day
      (1) Tell parents to try to attain this objective (within reason)
      (2) If they are busy at that time, though, they should feel free to record at another time.
      (3) Home recording can be at any time after school and before bedtime. It should not be during a meal.

5. Tell them that the 3 essentials of recording are a golf counter, a kitchen timer, and a recording sheet (which we will supply).
   a. explain and demonstrate how the counter and timer work
   b. try to place timer away from child so that no ticking (an S^D) can be heard.

(continued)

YESHIVA UNIVERSITY

FERKAUF GRADUATE SCHOOL
OF HUMANITIES AND SOCIAL SCIENCES
55 Fifth Avenue / New York, N.Y. 10003 / (212) 255-5600

DEPARTMENT OF SPECIAL EDUCATION

CONSENT FORM
YESHIVA UNIVERSITY SELF-INJURY PROJECT

Dear Parent:

We are glad that you have indicated an interest in having both you and your child participate in the Yeshiva University Self-Injury Project. The project has been officially funded by the United States Office of Education, Bureau of Education for the Handicapped. The grant has been awarded to Dr. Robert Gaylord-Ross of the Yeshiva University Special Education Department.

At this time we would like you (either parent or guardian) to formally indicate your consent for your child to participate in the project. Kindly fill in the name of your child, your signature and the date.

I HEREBY GIVE PERMISSION AND CONSENT FOR MY CHILD_____

TO PARTICIPATE IN THE YESHIVA UNIVERSITY SELF-INJURY PROJECT.

_____(Parent or Legal Guardian

_____Date

Procedure (Trainer's form)

5. c. Explain to the parents that they must be in the room where the child is during ½ hour. Feel free, though, to conduct normal activities.

d. In the same manner the teachers should conduct normal activities while recording but, make sure the child is in their immediate working group (whether small or large).

e. At the end of the half-hour session they should immediately record

(1) The time and ate the session ended

(2) The number of SIBs

f. Place timer, counter, and sheet in a safe place when not in use.

6. Tell the parents that you will be consulting in the home about once per week. Tell the teachers you will be circulating to give advice. Give parents your phone number for questions.

7. Ask parents to sign consent form.

APPENDIX B

HOME Assessment Form

HOME INVENTORY (Birth to Three)
(Home Observation for Measurement of the Environment)

Child's Name _____ Date of Interview _____

Child's Birthdate _____ Interviewer _____

Relationship of Person interviewed to child _____ Place of Interview _____

Family Composition _____
(Indicate persons living in household, including sex and age of children)

Persons present in home at time of interview _____

Comments _____

STANINES (N = 124)

RAW SCORES	1	2	3	4	5	6	7	8	9	Mean	S.D.
I	1-3	4	5-6	7	8	9	10	11	-	7.8	2.3
II	1-2	3	4	5	-	6	7	8	-	5.5	1.5
III	1-2	3	-	4	5	-	6	-	-	4.8	1.2
IV	1	2	3-4	5	6	7	8-9	-	-	6.1	2.5
V	-	1	2	-	3	4	5	6	-	3.4	1.7
VI	-	1	-	2	3	-	4	5	-	2.8	1.3
Total	20	20-21	22-24	25-28	29-32	33-36	37-40	41-43	44-45	30.4	7.7

Factor	Raw Score	Stanine
I Emotional and Verbal Responsivity of Mother		
II Avoidance of Restriction and Punishment		
III Organization of Environment		
IV Provision of Appropriate Play Materials		
V Maternal Involvement with the Child		
VI Opportunities for Variety in Daily Routine		
Total		

From the Center for Early Development and Education
814 Sherman, Little Rock, Arkansas 72202

	YES	NO
I. EMOTIONAL AND VERBAL RESPONSIVITY OF MOTHER		
1. Mother spontaneously vocalizes to child at least twice during visit (exclude scolding).		
2. Mother responds to child's vocalizations with a vocal or verbal response.		
3. Mother tells child the name of some object during visit or says name of person or object in a "teaching" style.		
4. Mother's speech is distinct, clear, and audible to interviewer.		
5. Mother initiates verbal interchanges with observer -- asks questions, makes spontaneous comments.		
6. Mother expresses ideas freely and easily and uses statements of appropriate length for conversation (e.g., gives more than brief answers).		
*7. Mother permits child occasionally to engage in "messy" types of play.		
8. Mother spontaneously praises child's qualities or behavior twice during visit.		
9. When speaking of or to child, mother's voice conveys positive feeling.		
10. Mother caresses or kisses child at least once during visit.		
11. Mother shows some positive emotional responses to praise of child offered by visitor.		
SUBSCORE		
II. AVOIDANCE OF RESTRICTION AND PUNISHMENT		
12. Mother does not shout at child during visit.		
*13. Mother does not express overt annoyance with or hostility toward child.		
14. Mother neither slaps nor spanks child during visit.		
**15. Mother reports that no more than one instance of physical punishment occurred during the past week.		
16. Mother does not scold nor derogate child during visit.		
17. Mother does not interfere with child's actions or restrict child's movements more than three times during visit.		
*18 At least ten books are present and visible.		
*19. Family has a pet.		
SUBSCORE		

* May require an interview probe unless can be observed.
** Will require interview probe unless mother mentions spontaneously

		YES	NO
	III. ORGANIZATION OF PHYSICAL AND TEMPORAL ENVIRONMENT		
**20.	When mother is away, care is provided by one of three regular substitutes.		
**21.	Someone takes child into grocery store at least once a week.		
**22.	Child gets out of house at least four times a week.		
**23	Child is taken regularly to doctor's office or clinic for check-ups and preventive health care		
*24.	Child has a special place in which to keep his toys and "treasures."		
25.	Child's play environment appears safe and free of hazards		
	SUBSCORE		
	IV. PROVISION OF APPROPRIATE PLAY MATERIALS		
*26.	Child has one or more muscle activity toys or pieces of equipment.		
*27.	Child has push or pull toy.		
*28.	Child has stroller or walker, kiddie car, scooter, or tricycle.		
29	Mother provides toys or interesting activities for child during the interview.		
*30.	Provides learning equipment appropriate to age -- mobile, table and chairs, high chair, play pen.		
*31	Provides learning equipment appropriate to age -- cuddly toy or role-playing toy.		
*32.	Provides eye-hand coordination toys -- items to go in and out of receptacle, fit together toys, beads.		
*33.	Provides eye-hand coordination toys that permit combinations -- stacking or nesting toys, blocks or building toys		
*34.	Provides toys for literature and music (books, records, toy musical instruments).		
	SUBSCORE		
	V. MATERNAL INVOLVEMENT WITH CHILD		
35.	Mother tends to keep child within visual range and to look at him often.		
**36	Mother "talks" to child while doing her work.		
*37.	Mother consciously encourages developmental advance.		
*38.	Mother invests "maturing" toys with value via her attention.		
**39.	Mother structures child's play periods.		
*40.	Mother provides toys that challenge child to develop new skills.		
	SUBSCORE		
	VI. OPPORTUNITIES FOR VARIETY IN DAILY STIMULATION		
**41	Father provides some caregiving every day		
**42.	Mother reads stories to child at least three times weekly.		
**43	Child eats at least one meal per day with mother and father		
**44	Family visits or receives visits from relatives approximately once a month.		
**45	Child has three or more books of his own.		
	SUBSCORE		

APPENDIX C

Manuscripts

1. An Analysis of Antecedent, Response, and Consequence Events in the Treatment of Self-Injurious Behavior.

2. A Decision Model for the Treatment of Aberrant Behavior in Applied Settings.

3. The Relationship Between Task Difficultyand Inappropriate Behavior in Severely Retarded Children.

An Analysis of Antecedent, Response, and Consequence Events in the Treatment of Self-Injurious Behavior[1]

Robert J. Gaylord-Ross and Marian Weeks

Yeshiva University

Running Head: Treatment Analysis of Self-Injurious Behavior

[1]The authors wish to thank Carol Lipner for her fine work as the trainer in the study. We are also grateful for the cooperation of staff members at the Brooklyn School for Special Children, particularly Marilyn Cohen (teacher), Rabbi Block (director), and Arlene Perlson (educational coordinator). Requests for reprints can be sent to the first author: Special Education Department, Yeshiva University, 55 Fifth Avenue, New York, New York 10003.

Abstract

The ability to alter levels of self-injurious behavior (SIB) was investigated by manipulating antecedent, response, and consequence events. A female, retarded adolescent exhibited hand-biting responses that appeared to be under the control of negative reinforcement. Daily treatment sessions revealed a small reduction in SIB through positively reinforcing on-task responses. Varying the frequency of mands also had a small, but consistent effect on the rate of SIB. A mand x task interaction appeared to account for the localized appearance of high frequency SIB. That is, when a mand and a particular task (sorting) co-occured, there was a high probability for SIB to appear in close temporal contiguity. The mand or sorting task alone did not lead to the concomittant appearance of SIB. An escape, rather than avoidance, conditioning explanation of SIB was advanced with mands and tasks producing a compounded aversive condition.

An Analysis of Antecedent, Response, and Consequence Events in the Treatment of Self-Injurious Behavior

There has been considerable interest in analyzing and treating self-injurious behavior (SIB) from an operant perspective (Bachman, 1972; Baumeister & Rollings, 1976; Carr, 1977; Frankel & Simmons, 1976). Although no studies have documented the natural, longitudinal acquisition of SIB, it has been assumed that the behavior is maintained by positive or negative reinforcement. The treatment of self-injury has in almost all reported cases attempted to manipulate consequence events. Thus, the self-injurious response has been contingently punished with aversive stimuli (Lovaas & Simmons, 1969), overcorrection (Azrin, Gottlieb, Hughart, Wesolowski, & Rain, 1975), and timeout (Jones, Simmons, & Frankel, 1974) procedures, or, alternative behaviors have been positively reinforced (Repp & Deitz, 1974). Relatively little attention has been given to controlling SIB through the manipulation of antecedent and response events. Schroeder and Humphrey (Note 1) demonstrated how SIB can vary to a considerable degreee across activity settings. Carr, Newsom, and Binkoff (1976) experimentally elevated and suppressed SIB by varying the type of verbal stimuli delivered to a self-injurious child. When tacts (declarative statements) and no verbal stimuli were presented to the child in separate conditions, there were near-zero levels of self-injurious responding. However, in the condition where mands (instructional directives) were intermittently delivered to the child, SIB increased abruptly to a rather high rate.

The present study attempted to replicate and extend a number of the Carr et al. findings. The effects of instructional stimuli were investigated with a subject, who, as in the Carr et al. case, appeared to emit SIB which was maintained by negative reinforcement. That is, the SIB was typically emitted to

escape the task demands of teachers and other adults. The present study investigated the negative reinforcement of self-injury by examining antecedent, verbal stimuli and the types of collateral behaviors that co-occur with SIB. If SIB is conceptualized within an avoidance conditioning paradigm, the verbal stimulus (mand) is a cue for an aversive event to follow. The aversive event could be an externally delivered stimulus or some characteristic of the response required from the subject. Given that responses have varying probability and preference values (Herrnstein, 1973; Premack, 1959), a subject may attempt to avoid a response with aversive properties by emitting an aberrant behavior like self-injury. Unfortunately, the Carr et al. study did not separate the type of verbal stimulus from the type of required response. A mand was always followed by a set of similar motor responses. In the present study, the effect of the type of task (aversive or preferred) on the rate of self-injury was examined. Finally, the ability to reduce SIB through manipulating antecedent and response events was compared to a more traditional procedure of positively reinforcing alternative behavior. That is, the treatment effects of positively reinforcing alternative behavior in order to decrease SIB were evaluated with respect to the antecedent and response procedures.

Method

Subject

The person under study was a 16-year-old severely retarded female who was attending a special school for the severely handicapped. Although she produced no words orally, she had a rather large receptive vocabulary. The subject frequently bit herself on both hands and arms; a behavior which reportedly had been present for 11 years. The SIB appeared either as a single bite to the hand or arm or as a series of bites occurring in rapid succession. The subject had participated in a previous study (Gaylord-Ross, Note 2) during which it had been observed that her rate of self-injury varied considerably across instructional tasks. It was also

demonstrated that a procedure consisting of the differential reinforcement of incompatible behavior (DRI) more effectively reduced SIB than contingent restraint, timeout, or the differential reinforcement of other behavior. The positive consequence demonstrating the greatest potency had been verbal praise. Furthermore, the SIB appeared to be maintained by negative reinforcement because: (a) there was little SIB when no task demands were given by the teacher or trainer; (b) when instructional demands were delivered SIB tended to increase; (c) SIB immediately decreased at the cessation of instructional demands.

Procedure

Sessions were held on Tuesday through Thursday at 10 a.m. in a 4 x 5 m room in a school for the severely handicapped. A 21-year-old, female trainer sat next to the subject at a 1.5 x 1.5 m table. Videotape equipment in the room was turned on by the trainer at the beginning of each session.

Task subconditions. The experimental session was divided into three subsessions (subconditions) of eight min duration. There was no interval between subsessions, and the order of subsession presentation was counterbalanced across daily sessions. The selection of the different tasks was based on anecdotal reports stating that the subject displayed task preferences and that the frequency of SIB varied according to the particular task being engaged. Such reports also indicated that SIB appeared to be correlated with the presence of social interaction and verbal demands.

In the Puzzle subcondition the subject was presented with a series of puzzles to complete. The trainer presented a board with a 60-120 piece puzzle at the beginning of the subsession or whenever another puzzle had been completed. During the subsession the trainer gave instructional commands to: (a) do the puzzle when it was presented; (b) continue doing the puzzle when her pace declined;

(c) make corrections when errors occurred and persisted. Instructional commands were given when the trainer judged them to be necessary during the first three treatment conditions. Although there was no systematic pattern of delivery of mands, they consistently had an overall, subsession average of one per min. During the last three treatment conditions the rate of mands was systematically controlled so that the trainer delivered a mand every 30 or 60 sec. When a self-injurious response occurred the trainer looked away from the child and made no verbal comments during and immediately after the behavior. This procedure was instituted to avoid the inadvertant social reinforcement of SIB.

In the Sorting subcondition the subject was presented with a pail containing buttons that differed in color. She was required to place each of the buttons in the correct bin on the table that contained buttons of the identical color. The trainer made the same types of instructional commands as in the Puzzle subcondition. During the first three treatment conditions the mands were delivered when the trainer judged them to be necessary. Over sessions, though, there was a consistent rate of two mands per min. During the latter three treatment conditions mands were systematically delivered at one per 30 sec or one per min. Self-injurious responses were not visually or verbally attended to by the trainer.

In the Isolate subcondition the trainer made no verbal statements (mands, praise, or other comments) to the subject. Her body position was at a 45 degree angle to the subject. She read a book throughout the subsession except to set up materials at the completion of the task. Three tasks were always presented on the table in front of the subject. They were a puzzle task, a sorting task, and a coloring task. Their left-right position on the table was counterbalanced across daily sessions. The puzzle and sorting tasks were identical to those in the Puzzle and Sorting subconditions, respectively. The coloring task consisted of a sheet of white drawing paper and a number of crayons. The subject could always choose

which task to perform during the subsession without trainer prompting. She could also do nothing or emit off-task behaviors. Thus, there were always zero mands during the Isolate subcondtion. The one exception to this procedure was in the fifth treatment condition when the trainer systematically delivered one mand per 30 sec.

Treatment conditions. The ability to reduce SIB through positively reinforcing alternative behaviors was evaluated in the first three treatment conditions. An ABA design was run that consisted of Baseline 1, DRI-1, Baseline 2. This reversal design only applied to the Puzzle and Sorting subconditions since there were no verbal or gestural interactions between subject and trainer during the Isolate subcondition. Figure 1 shows how the task subconditions were within-session contrasts, while the successive treatment conditions consisted of contrasts between blocks of sessions.

During Baseline 1 and Baseline 2 the trainer presented the puzzle and sorting tasks. When a correct response was made there was no contingent consequence. A correct response in Puzzle was placing a single piece in the proper position on the board. A correct response in Sorting was placing a button in the appropriate bin. In DRI-1 the same procedure prevailed except that correct task responses were contingently reinforced with enthusiastic verbal praise.

In the last three treatment conditions--DRI-2, DRI-3, DRI-4--rates of instructional commands were systematically varied. Correct task responses were always positively reinforced in the Puzzle and Sorting subcondtions. A reversal design was applied so that the number of mands per min (in both Puzzle and Sorting subconditions) was one in DRI-2, two in DRI-3, and one in DRI-4. An additional change in the rate of mands was instituted in Isolate. During the Isolate subsessions, which corresponded to DRI-3 in the Puzzle and Sorting subconditions,

mands were systematically delivered every 30 sec and correct task responses were positively reinforced.

Recording. The eight min subsessions were videotaped and later scored using an interval recording procedure. The observer watched the videotape for 20 sec, turned the videorecorder off, and recorded whether SIB did or did not occur. The videorecorder was then turned on for another 20 sec interval and the procedure was repeated. A total of 24 20-sec intervals was scored for each of the three subconditions.

Interobserver reliability coefficients were calculated from nine randomly selected subsessions. Two observers simultaneously viewed and scored the videotape subsessions using the 20 sec interval procedure. Percentage agreement was calculated by dividing the number of intervals in which the observers agreed by the total number of agreements plus disagreements (24) and multiplying the quotient by 100. Reliability coefficients ranged between 91.7% and 100.0%, with a mean of 98.6%.

Anecdotal reports had also indicated that the appearance of SIB seemed to covary with different types of vocalizations. To investigate these relationships in more detail, a 20 sec interval procedure was used for tabulating loud and soft vocalizations. Loud vocalizations were defined as high volume screams and howling-like noises. Soft vocalizations were low volume "mooing" sounds. Loud and soft vocalizations were recorded from a sample of the Sorting and Puzzle subsessions. The subsessions with the high, median, and low frequency of SIB in each treatment condition for Sorting and for Puzzle were scored (except to B2, which contained only 2 sessions. Of these 34 subsessions five were randomly selected for reliability checks. The same percentage agreement formula was calculated for vocalizations as had been used for SIB. Reliability coefficients for loud vocalizations ranged between 83.3% and 95.8%, with a mean of 92.5%. Reliability coefficients for soft vocalizations ranged between 70.1%

and 100.0%, with a mean of 86.7%.

Finally, a more precise analysis was conducted of the temporal relationships between mands and SIB. Mands alone, and mands followed by SIB within five sec, were recorded from the videotape in a continuous (non-interval) manner. That is, an event recording procedure was applied to tabulate the frequency of each measure in a subsession. The same subsessions sampled for the recording of loud and soft vocalizations were scored again for mands alone and mands followed by SIB. Reliability coefficients were calculated for each measure from randomly sampled subsessions with a percent agreement formula of dividning the smaller frequency (of one of the observers) by the larger frequency and multiplying the quotient by 100. Interobserver agreement for mands alone ranged between 57.1% and 100.0% with a mean of 80.6%. Interobserver agreement for mands followed by SIB ranged between 57.1% and 100.0%, with a mean of 80.0%.

Results

An inspection of Figure 1 illustrates that the major differences in the frequency of SIB were among the three task subconditions. The frequency of SIB was high in Sorting with an average of about 16 intervals per subsession. The frequency of SIB in the Puzzle and Isolate subconditions was quite low with an average of about two intervals per subsession. The one exception to the trend occurred in Isolate during the DRI-3 treatment condition. Here, SIB increased markedly to a mean of 11.6 intervals.

Insert Figure 1 about here

In contrast to the substantial differences in SIB across task subconditions, there were rather small, but consistent differences in SIB across treatment conditions. The first three conditions showed a minor reversal of SIB frequency in Sorting as a function of the application and withdrawal of contingent verbal

reinforcement. SIB averaged 19.0 intervals in Baseline 1, 15.4 in DRI-1, and 19.5 in Baseline 2. In the latter three treatment conditions in Sorting there was a second minor reversal of SIB frequency as a function of varying the rate of mands. When mands were systematically presented at a lower rate of one per min in DRI-2, the mean frequency of SIB dropped to 11.7. When the number of mands were systematically increased again to the previously higher rate of two per min in DRI-3, the frequency of SIB increased to 15.6. Mands were systematically decreased to one per min in DRI-4 and the frequency of SIB dropped slightly to 14.7. Examining the Sorting results as a whole, the highest frequency of SIB was observed when a higher rate of mands and no positive reinforcement were delivered. The lowest frequency of SIB occurred when there was both a lower density of mands and DRI. However, in Puzzle there was no systematic change in the initially low frequency of SIB as a function of the density of mands and DRI.

A different relationship between mands and SIB was also substantiated in the Sorting and Puzzle subconditions. In Sorting, 54% of all mands were followed by SIB within five sec. In Puzzle, only 16% of all mands were followed by SIB within five sec. These findings were consistent across treatment conditions. Thus, a temporal correlation was observed between mands and SIB in Sorting, while such a relationship was absent in Puzzle.

The frequency of SIB in Isolate was consistently low (near zero) throughout all of the treatment conditions except DRI-3 (the only condition in which mands were delivered). Therefore, the increase (DRI-2→DRI-3) and decrease (DRI-3→DRI-4) in SIB can be viewed as a substantial reversal of SIB as a function of the presence or absence of mands. Interestingly, the puzzle , sorting, and coloring tasks were performed with approximately equal frequency throughout Isolate. When SIB did appear at a high level in the DRI-3 condition it rarely occurred when puzzles were being performed. In contrast, when sorting and coloring were

performed there tended to be considerable co-occurring SIB. Furthermore, during puzzle performance there was no observed temporal relationship between mands and SIB, while such a relationship did hold for sorting and coloring activity. Thus, coloring demonstrated similar functional relationships to sorting since there was much co-occurring SIB and a temporal relationship between mands and SIB.

Finally, SIB was correlated with the type of vocalizations. In the sessions sampled the mean number of loud vocalizations was 13.2 in Sorting and 4.0 in Puzzle. The mean number of soft vocalizations was 5.0 in Sorting and 12.3 in Puzzle. Furthermore, a significant, positive correlation (Pearson) was calculated between the frequency of SIB and loud vocalizations in the combined Sorting and Puzzle subsessions, r (34) = .88, $p < .01$, A significant, negative relationship was found between SIB and soft vocalizations, $r = -.53$, $p < .01$. Thus, when SIB appeared with high frequency (typically in Sorting) there were a large number of accompanying screams and other loud vocalizations and few soft vocalizations. During subsessions when SIB occurred with low frequency (usually Puzzle) there were few loud vocalizations but a considerable number of low volume "mooing" sounds.

Discussion

The present findings extend the work of Carr et al. (1976) in demonstrating the effects of antecedent events on SIB. There was not a singular effect of mands on SIB, though. Rather, an interaction between mand and response type was observed. Only when a mand was delivered during performance of the sorting task did the frequency of SIB increase. When a mand appeared during puzzle performance or when sorting behavior occurred without a mand, there was little accompanying self-injury. This antecedent x response interaction was clinically significant since abrupt, within-session shifts in self-injurious responding

consistently occurred across task subconditions. The interaction was further documented during sorting behavior by the co-occurence of mands and SIB. That is, mands were frequently followed by SIB within a five sec interval. Also, the number of SIBs in Sorting subsessions was positively correlated with the density of mands. This finding parallels the study of Budd, Green, and Baer (1976) which showed a direct relationship between the number of instructional directives delivered by mothers of preschoolers and the frequency of deviant behaviors.

Although the subject's self-injury appeared to be maintained by negative reinforcement, an avoidance conditioning paradigm does not seem to adequately explain the observed behavior. For the avoidance explanation to be tenable, the mand would have to function as a conditioned stimulus (signal) and the sorting task as the subsequent aversive event. But sorting behavior alone did not display aversive properties since there was little accompanying SIB in the absence of mands. Furthermore, sorting was frequently chosen as a task activity in Isolate. It was only when sorting behavior co-occurred with a mand that SIB tended to be emitted. This pairing of mand and task appeared to have a compounding effect to produce an aversive condition. SIB would subsequently follow as an attempt to terminate or escape from the compounded aversive condition. Thus, negative reinforcement in this context is characterized exclusively as an escape, and not avoidance, conditioning phenomenon. The fact that the mand-sorting-SIB sequence was truly aversive received support form the accompanying, negative emotional behaviors (loud vocalizations).

The contingent application of verbal praise for correct task responses had a minor, though systematic, effect of reducing the frequency of self-injury. While the limited effect of DRI on the suppression of SIB is in need of further replication, it does suggest that the positive reinforcement of alternative

behaviors may be a less effective treatment approach for aberrant behaviors maintained by negative reinforcement. Theoretically, for DRI to be successful, alternative response chains would have to be established to the extent that they would successfully compete with the aberrant behavior. This development is likely to be of a more long-term nature. At the same time, if the aversive stimuli leading to the escape responses remain in the individual's milieu, the aberrant behavior should continue to be maintained by negative reinforcement. In contrast, a more intrusive treatment procedure like overcorrection prevents escape from the demands of a caretaker because of the manual control exerted on the client. Through such counter-control by the caretaker, the escape function (negative reinforcement) of the aberrant behavior may quickly be eliminated. The immediate success of overcorrection reported in eliminating SIB (Azrin et al., 1975) may be due to the ability of overcorrection to preclude successful escape from aversive elements.

In conclusion, the present study demonstrates changes in the level of SIB to be a function of manipulations antecedent and response events. The manipulations of antecedent and response events can be considered ecological interventions since they alter the stimuli and activities in the environment (cf. Hart & Risley, Note 3). Here, the type of activity was varied and a particular antecedent event (mands) was withdrawn or varied in its rate of presentation. More traditional operant interventions have attempted to affect the rate of aberrant behaviors through manipulating consequence events, e.g., punishment (cf. Bucher & Lovaas, 1968). Another type of intervention attempts to change the aversive quality of the events that are functionally related to the aberrant behavior. For example, Carr et al. (1976) embedded mands in the context of continuous verbalizations. In this manner, the salient aversive qualities of the mands were decreased and SIB was concomitantly reduced. In a somewhat similar way, Ross, Meichenbaum, and Humphrey (1971) used a desensitization procedure to change the quality of stimulus events and concomitantly

reduce SIB. Thus, there appears to be an increasing number of viable interventions for the clinician and educator to apply in reducing self-injury. The type of treatment procedure selected should depend upon the conditions maintaining the behavior. There is certainly a need for further investigation of the variables which maintain aberrant behavior and the appropriate treatment match.

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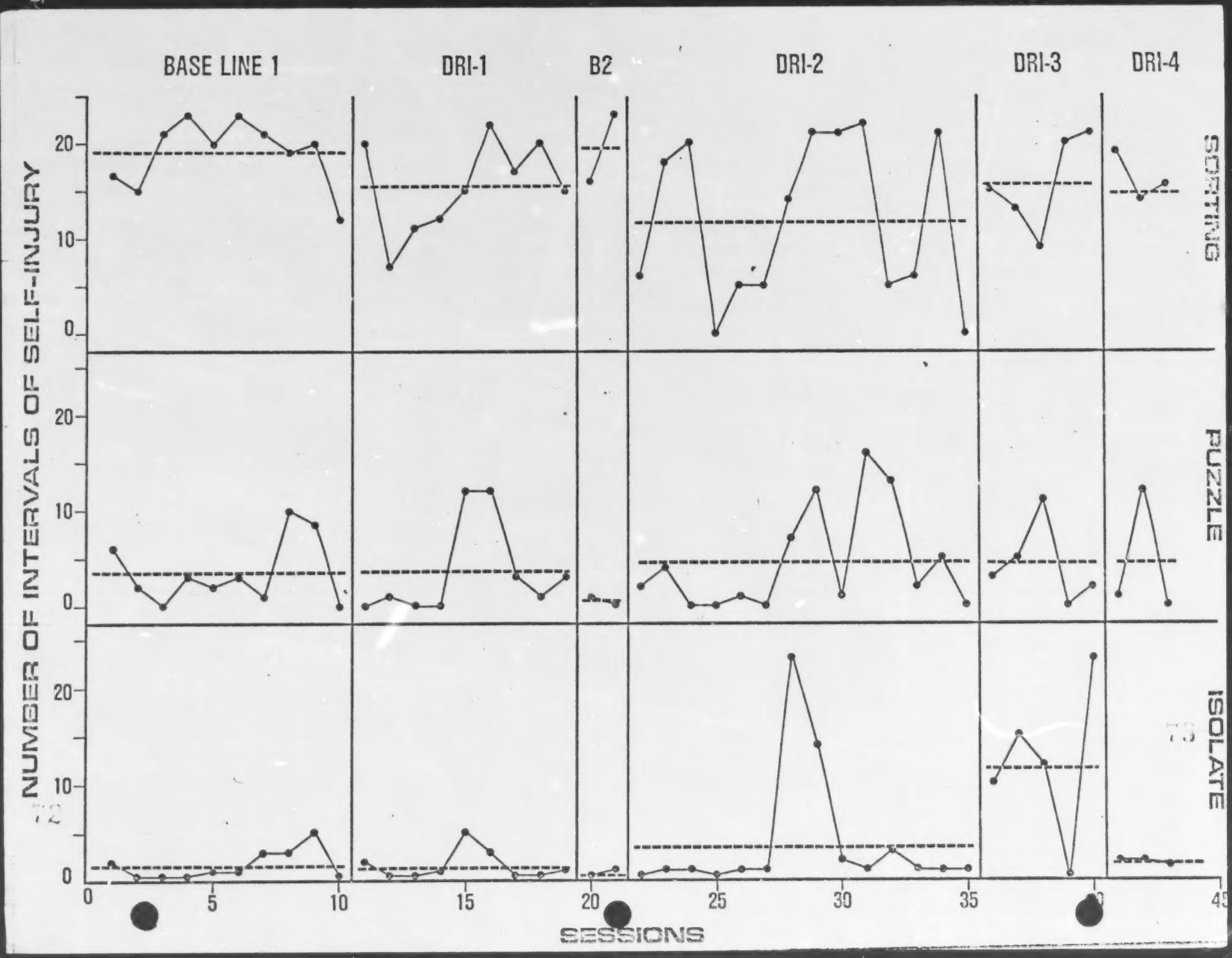
Figure Caption

Figure 1. Frequency of self-injurious behavior across treatment conditions and task subconditions. Frequency reported in number of 20-sec intervals in which SIB occurred in each subsession. Broken horizontal lines indicate means for task subcondition in each treatment condition.


BASE LINE 1
DRI-1
B2
DRI-2
DRI-3
DRI-4
SCRATCHING
PUZZLE
ISOLATE
NUMBER OF INTERVALS OF SELF-INJURY
0
10
20
0
5
10
15
20
25
30
35
SESSIONS

A Decision Model for the Treatment of Aberrant Behaviors in Applied Settings

Robert Gaylord-Ross*

San Francisco State University

Running Head: Model for Treatment of Aberrant Behavior

*Work completed on this paper was supported in part by grant G007603954 from the Bureau of Education for the Handicapped. I would like to thank Marian Weeks and Luanna Voeltz for their conceptual input given for ideas developed in this paper. Reprints may be obtained from the author: San Francisco State University, Special Education Department, 1600 Holloway Avenue, San Francisco, California 94132

Abstract

A sequential-decision model was presented for the treatment of aberrant behavior of severely handicapped students. A five-component, flow chart model recommended how teachers should proceed in a step-by-step fashion to remediate problem behaviors. The sequential model suggested the consideration and use of four types of intervention approaches in the following order: behavior analysis, ecological, curricular, and punishment. The model attempts to give programmatic direction to teachers and other practitioners by selectively reviewing and interpreting the expanding research literature on aberrant behavior.

A Decision Model for the Treatment of
Aberrant Behaviors in Applied Settings

Aberrant behaviors have had an important role in the diagnosis and treatment of severely handicapped individuals. Definitionally, severely handicapped persons have been characterized as having low intellectual functioning, limited adaptive behavior skills, and the appearance of aberrant behaviors like self-injury, aggression, and other stereotypes (U.S. Office of Education, 1974). More formally, diagnostic instruments like the AAMD Adaptive Behavior Scales have defined mental retardation in terms of deficiencies in a number of skill domains and the prevalence of aberrant behaviors (Grossman, 1973). Autism, another severely handicapping condition, has as one of its primary defining characteristics the appearance of bizarre and aberrant behaviors. In fact, the term "autistic-like" behaviors has emerged to categorize some of these aberrant behaviors like finger and object twirling, body rocking, and self-injury. Aberrant behaviors can also have an impeding effect on the instruction and development of severely handicapped persons. When an individual spends a disproportionate amount of time engaging in aberrant behaviors it will be more difficult for that person to attend to instructional stimuli (Lovaas, Litrownik, & Mann, 1971). In turn, fewer correct responses will be emitted and the acquisitional rate for learning important skills will be decreased (Koegel & Covert, 1972). At a more general level, developmental and curricular progress will be impeded because of the excessive engagement in aberrant behaviors. Thus, it is important to eliminate or significantly reduce aberrant behaviors in

order to: (1) protect the individual and others from potentially harmful acts; (2) promote the developmental acquisition of important skills, e.g., motor, communication, social, etc.

Fortunately, there has been a growing research literature that has documented techniques that effectively decelerate aberrant behaviors (Baumeister & Rollings, 1976; Horner, Note 1; Schroeder, Mulick, & Schroeder, in press). Behavior modification techniques that either punish the aberrant behavior or positively reinforce alternative behaviors have been shown to significantly reduce a number of problem behaviors. While many of these experimental demonstrations have been impressive, e.g., Lovaas and Simmons (1969), there is still a need to extend their findings and techniques to more applied and natural settings. That is, functional control has often been obtained over aberrant behaviors in rather controlled, experimental settings where there is elaborate equipment and/or an abundance of staff members to record and treat the subject's behavior. In more natural settings like classrooms, though, it is not likely that similar staff ratios and hardware will be available. Under such non-experimental circumstances it is important to evaluate which technique(s) can be carried out and effectively reduce aberrant behaviors. For example, Kelly and Drabman (1977) reported of the successful application of an overcorrection procedure to reduce self-injurious behavior. In a follow-up to the research project, though, it was found that the staff members were not implementing the overcorrection procedure because it was physically exhausting and it placed too many time demands on staff that detracted from the attention that had to be given to the other children in the class.

In conjunction with developing procedures that have utility in

natural settings, it may be useful to explore approaches other than behavior modification. For example, a curricular-developmental approach would focus upon building skill repertoires without directly treating the aberrant behavior (Gaylord-Ross, in press). Aberrant behaviors would be expected to drop out or never appear when longitudinal educational programs were in effect. The successful training of skill clusters would compete with the appearance of aberrant responses. An advantage of the developmental-curricular approach is that it falls within the framework of activities already being carried out in the classroom, i.e., the implementation of instructional programs. In this sense the curricular-developmental approach is more cost-effective because it does not require "special" intervention programs. Rather, modifications in curricula are made which should lead to concomitant reductions in aberrant behavior (cf. Weeks & Gaylord-Ross, Note 2).

A second alternative to a strictly behavior modification approach is to make changes in the physical and social ecology that may affect the frequency of appearance of aberrant behaviors. Rago, Parker, and Cleland (1978) have shown, for instance, that crowding tends to lead to more aggressive behavior among profoundly retarded persons. It is conceivable that redesigning the spatial arrangements and social interaction patterns in classrooms or other settings could have positive effects in reducing aberrant behavior (cf. Hart & Risley, Note 3). Such ecological manipulations when put into effect could also be more cost-beneficial because they would require little ongoing monitoring and program delivery. For example, once partitions are put into a particular area with students grouped into activities within these

partitioned zones the ecological changes would be completed. There would be no need for special programming since activities would proceed within this new ecological context. Unfortunately, little research has been conducted to evaluate the effectiveness of different ecological adaptations.

Thus, a number of alternatives exist for the treatement of aberrant behavior. Behavioral, curricular, and ecological techniques are not mutually exclusive approaches. Instead, they should be viewed as strategies that teachers and other professionals are familiar with and capable of implementing. In this sense, the aim of the present paper is to offer a sequential-decision model that will provide direction to professionals in how they should proceed in dealing with aberrant behavior. The sequence of steps in dealing with aberrant behavior is justified on logical, empirical, and ethical grounds. Logically, it is felt that after an initial assessment is made, there exist a number of specific behavioral techniques that may be tried and which have been shown to result in rather immediate reductions in aberrant behavior (Baumeister & Rollings, 1976; Frankel & Simmons, 1976). Next, possible environmental and curricular modifications are suggested. Finally, it may be necessary to implement a punishment procedure in order to attain response suppression over more difficult behaviors. Punishment is only used, and therefore is ethically justified, after a number of "positive" approaches have been tried and evaluated.

A Sequential-Decision Model

The five components of the sequential-decision model appear in flow chart form in Figure 1. Each component is broken into further subcom-

ponents that appear in more detailed flow charts (Figures 2-6). Flow charts have been shown to be useful ways to present the procedural steps in training programs (cf. Guess, Sailor, & Baer, 1976; Striefel, 1974). If the visual format is difficult for some persons to follow, the sequence of steps can be translated into a verbal checklist format. Flow charts have the advantage, though, of presenting decision or branching steps in a clear manner.

Insert Figure 1 about here

The flow chart is constructed so that the user can check-off the various steps to see if they are having a causal or maintenance effect on aberrant behavior. For example, a teacher would first examine the different behavioral (Component 2) causes of aberrant behavior. If none of these factors appear causal, the teacher would then move on to investigate the possible ecological causes of aberrant behavior. This procedure would continue until all of the components had been examined. The flow chart offers the further advantage of recommending a particular intervention technique after a specific causal factor has been identified. The amount of empirical support for the treatment recommendations varies a great deal. The behavioral and punishment components have received a good deal of experimental validation. The ecological and corricular components have received less experimental investigation. Therefore, the treatment recommendations within these components are also based on anecdotal evidence and other unpublished reports.

Assessment

The primary objective of the assessment component is to determine whether the aberrant behavior(s) is serious enough to warrant special programming. The monitoring and implementation of behavioral management programs often require efforts that can detract from instructional time and lead to unwanted staff fatigue. It is therefore imperative to make an accurate assessment of the severity of the behavioral problem so that a proper decision can be made with respect to implementing a special program. In making this decision quantitative data should be collected and considered. The major emphasis in making the decision, though, should be in developing a qualitative, clinical judgement concerning the severity of the behavioral problem. The clinical judgement should consider the obtrusiveness and harmfulness of the behavior. Is the behavior causing physical harm to the student or other persons? Is the behavior disrupting classroom instruction to a significant degree? Does the behavior appear to be triggering collateral emotional reactions, e.g., excessive crying or screaming, extreme withdrawal? Is the behavior so contextually inappropriate that it is leading to social exclusion and a limitation in the number of places and experiences the student can engage in? An initial clinical judgement should be made by a designated professional, or preferably, by a transdisciplinary team (Figure 2). If it is concluded that the behavior is not clinically severe or obtrusive, any further analysis within the flow chart is terminated at the "stop" module (Figure 2). When an affirmative judgement is made, the next step is to obtain quantitative baseline data. Baseline data can be obtained through frequency or interval measures;

with a continuous or time sampling procedure (Gentry & Haring, 1976). After baseline data has been collected, a second clinical judgement is made with both qualitative and quantitative factors affecting the determination. Quantitative data can alter the perceptions of the seriousness of a behavior problem by pointing to its low or high frequency.

Insert Figure 2 about here

If an affirmative, clinical judgement is made, it is next necessary to consider possible medical causes of the behavioral problem. For example, an inner ear infection might lead to chronic ear-digging behavior. Also, changes in medication can produce an increase in the frequency of stereotypical behavior (Baumeister & Forehand, 1973). This module in the flow chart should not imply that pharmacological agents be prescribed to eliminate problem behaviors. Rather, only when a specific biomedical factor has been established as causal, should a corresponding biomedical intervention be prescribed. When the problem behavior: (a) has been judged to be clinically significant, and (b) biomedical factors have been ruled out (or tried and failed) the flow chart should proceed to Component 2.

Behavioral Analysis

Component 2 offers a behavioral analysis of a number of factors that can maintain aberrant behaviors. The analysis focuses on consequence events. Specific treatment recommendations follow from each of the maintenance variables (Figure 3). The success of the different treatment

procedures has been rather well documented in a number of experimental studies (Bachman, 1972; Baumeister & Rollings, 1976' Schroeder et al., in press). The procedures are suggested under the assumption that the person is already participating in a contemporary educational or habilitative program. If this is not the case, and the person is receiving no program or an ineffectual (babysitting) program, the first recommendation would be to supply or upgrade the program. While behavior analysis can be conducted in a programmatic vacuum, this strategy would be misguided. Without effective educational programming behavior modification is reduced to a reactive strategy, where a particular reinforcement program may suppress a behavior; with the likelihood that another aberrant behavior may appear. Thus, an ecobehavioral analysis (Rogers-Warren & Warren, 1977) must be used that accounts for ecological and curricular, as well as behavioral variables.

Insert Figure 3 about here

Positive (social) reinforcement

A wide variety of problem behaviors can be maintained by contingent social attention (Bandura, 1969). Often the persons in contact with the individual are not aware that they are contingently reinforcing the undesireable behavior. The first module in Component 2 (Figure 3) calls for an analysis of whether the aberrant behavior appears to be maintained by social reinforcement. If a functional relationship is not evident after a number of observations have been made, one would proceed to the next

module in the flow chart. If it was suspected or ascertained that positive reinforcement was maintaining the behavior, the treatment recommendation would be extinction training. Extinction training requires that all persons having contact with the student would never attend (verbally or gesturally) to the aberrant response immediately after it occurred. Extinction training should break the functional relationship between response and consequence so that the former disappears. One problem with extinction training in applied settings, though, is that caretakers often cannot consistently ignore the problem behavior (Gilbert, 1976). The inconsistent ignoring of a behavior places the individual on an intermittent schedule of reinforcement, which can maintain behaviors in a very powerful manner. Another problem with extinction is that there will typically be an increase in responding immediately after the procedure is put into effect (Lovaas & Simmons, 1969). Increases in responding may be medically and ethically unjustified with certain behaviors that can result in extensive damage to the individual or others.

After the procedure has been carried out for a number of sessions or days (5-10 as a rule of thumb), it should be evaluated by contrasting treatment with baseline levels of occurrence. Reversal or other acceptable designs may be applied to further evaluate the scientific validity of the treatment effects. If extinction has not reduced the aberrant behavior to a near-zero level, one should proceed to the next module in the flow chart. If successful response suppression is demonstrated, the flow chart analysis would terminate at the "stop" module. It would then be necessary to continue or fade out the program according to the particular characteristics of the case. This algorithm of program imple-

mentation, evaluation, and stop or proceed to the next variable, will be used throughout the sequential-decision model.

Negative Reinforcement

It is also possible for aberrant behavior to be maintainted by negative reinforcement (Carr, 1977), where the emission of a response leads to the cessation of an aversive stimulus. Negative reinforcement operates as an attempt to escape from an undesireable state of affairs. Sometimes severely handicapped persons that have never participated in an educational program exhibit displeasure in engaging in instructional tasks. More specifically, Carr, Newsom and Binkoff (1976) and Gaylord-Ross and Weeks (Note 4) have shown instructional commands (mands) for non-preferred tasks to lead to the appearance of self-injurious behavior. This mand-aberrant response relationship seemed to be maintained by a negative reinforcement paradigm. Sometimes caretakers will decrease their frequency of mands in order to obtain concomitant decreases in aberrant behavior. Limiting the educational involvement of the student can strengthen the negative reinforcement relationship by correlating aberrant responses with fewer task demands. To eliminate this effect, Plummer, LeBlanc, and Baer (1977) used a "paced instructions" procedure that required teachers to deliver mands in a periodic and frequent way. In a manner similar to paced instructions, a "putting through" procedure would require the student to complete a task after a mand is presented. Manual or other prompts may be required to insure that the task is completed. The cessation of the negative reinforcement of aberrant behavior is important on two accounts. First, an undesireable behavior is eliminated. Second, the paced instructions and putting

through procedures guarantee that the student receives proper and undiminishing amounts of educational stimulation.

Density of reinforcement

Even within a contemporary special education program it is possible that a student may be experiencing a lean schedule of positive reinforcement. When there is minimal positive reinforcement for on-task or other behaviors there is a greater likelihood that aberrant behaviors will be emitted. This is especially possible when the aberrant behaviors are instrinsically reinforcing, e.g., stereotypy (Lovaas et al., 1971), or when they are being socially reinforced.

It is therefore necessary to estimate the density of reinforcement a student receives during the different segments of the school day. If it is concluded that the density is too low, a number of interventions may be applied to increase the rate of reinforcement. Bailey and Meyerson (1970) gave noncontingent vibratory stimulation to effectively reduce self-injurious behavior. It may be sufficient to encourage staff and parents to increase the number of positive interactions they have with the student. Whether using noncontingent or contingent procedures, it is recommended that the rate of reinforcement be evaluated to see whether it has actually increased to an acceptable level.

There are a number of contingency procedures that are more systematically defined in terms of a rate or time parameter. The differential reinforcement of incompatible behavior (DRI) contingently reinforces a targeted, on-task behavior. Theoretically, the repeated reinforcement of the on-task response increases its likelihood of occurrence and concomitantly competes with, and decreases the likelihood of, appearance

of the aberrant response. DRI can entail the use of a task physically incompatible with the aberrant response, e.g., shirt buttoning for a person who engages in hand mouthing, or a task that permits a person to simultaneously engage in the aberrant behavior (Bachman, 1972; Young & Wincze, 1974). The differential reinforcement of other behavior (DRO) is a procedure that delivers reinforcement for the nonoccurrence of the aberrant response during a given time interval. Repp and Dietz (1974) reduced aggression and self-injury with DRO. DRO may be more difficult to implement in classroom settings and with high frequency behaviors because it requires the monitoring of frequency and time variables (Gaylord-Ross, Note 5).

Order

The order of appearance of the variables in Component 2 is somewhat arbitrary. All three variables have been shown to maintain aberrant behavior. In fact, it is possible for two or more variables to be maintaining one or more behaviors simultaneously. For example, a person's hair pulling could be maintained by social reinforcement while hand waving and screaming were maintained by negative reinforcement. In addition, the density of reinforcement is likely to interact with the other variables. A student receiving little positive reinforcement for an on-task behavior is likely to be more responsive to the social reinforcement of aberrant behavior. Also, when nonpreferred instructional tasks are rarely reinforced it is more likely that aberrant responses will be emitted to escape the mand or performance requirement.

Perhaps the best rationale for the order of the variables relates to their ease of implementation. Extinction should be the easiest

procedure to implement because it involves ignoring behavior. The putting through and paced instructions interventions merely entail the continuation of an instructional regime in a regulated fashion. The reinforcement density procedure requires more effort to implement because the staff must changed their pattern of interaction with students plus monitor response and/or time variables. However valid the order of variables may be, the primary function of the flow chart model is to make professionals aware of important maintenance variables and their corresponding treatment procedures.

Physical and Social Ecology

There has been relatively little investigation of the effects of ecological variables on the severely handicapped (see Berkson & Landesman-Dwyer, 1977); particularly when contrasted to the amount of research conducted from a behavioral perspective. Still, it seems evident that ecological variables should have important effects on the behavior and development of severely handicapped persons. The types of environments that the severely handicapped have resided in have often included a number of negative ecological factors, e.g., crowding, few objects to manipulate, etc. (Wolfensberger, 1972). It could be hypothesized that if critical alternations were made in residential and educational environments, there should be improvements in prosocial behaviors exhibited and a decrease in aberrant behaviors. Component 3 points out potentially important ecological variables and recommends milieu changes that professionals could make to obtain these more desired outcomes.

Limited physical space can create a condition of crowding. Rago et al., (1978) demonstrated that increasing the amount of physical space led to significant reductions in aggressive behavior among profoundly retarded adults. Thus, alterations in physical space may produce direct effects on aberrant behavior. One strategy would be to increase the size of the classroom or reduce the number of students per class if crowding seemed to be present (Figure 4). It may often be impossible for fiscal or other reasons to increase classroom space or to lower the student-teacher ratio. Alternative solutions would include shifting the students to different rooms throughout the school day so that the oppressiveness of a single crowded room may be varied and attenuated. Also, crowded space may be effectively "broken up" by partitioning the room into zones for different activities (Hart & Risley, Note 3).

Insert Figure 4 about here

A second ecological variable is the number of objects in the setting that are available for the person to manipulate. A number of studies have documented an inverse relationship between the enrichment of the environment (presence of people or manipulable objects) and the degree of stereotypy exhibited (Baumeister & Forehand, 1973; Berkson & Mason, 1963; Hutt & Hutt, 1965). When objects are available to manipulate the person engages the objects and concomitantly stops emitting aberrant behavior. An obvious implication of this finding is that classroom and other milieus should be designed so that there is an ample

supply of objects to engage. These objects should evoke the curiousity of the student and be readily available during non-instructional periods of the day. In this way there can be a more effective use of "down time" periods. It may be necessary to provide prosthetic devices to permit a multiply handicapped person to engage a particular object (Bigge & O'Donnell, 1976; Finnie, 1975). It may also be necessary to train the student in play skills (Wehman, 1977) so that objects may be engaged in a self-initiated manner during leisure time.

In addition to manipulable objects, it is important to consider the "face validity" of the classroom in terms of the furniture, wall decor, and other articles in the setting. Too often classes for the severely handicapped appear barren. The barren appearance of the classroom is due to limited funds; the manner in which severely handicapped students and their classrooms are conceived; narrowly trained teachers that are only versed in behavior-shaping techniques and not the design of "normalized" classrooms; a commitment to an isolated therapy model (Sternat, Nietupski, Lyon & Brown, 1977) that emphasizes one-to-one instruction in a homogeneous setting so that stimulus control can be gained over "distractable" severely handicapped students (Margolis, 1977). There has been an increasing emphasis placed on instruction occurring in more natural ways and settings (Brown, Nietupski, Hamre-Nietupski, 1976). Materials should be functional and geared to the chronological as well as the developmental level of the student (Gaylord-Ross, in press) so that, for example, a classroom for severely handicapped adolescents does not look like a preschool classroom. It has also been shown that productive instruction can take place in small group, as well as one-to-one

settings when the necessary instructional steps are taken (Koegel & Rincover, 1974). Although there has yet to be any experimental work showing the relationships between aberrant behavior and classroom face validity, it would seem that teachers should attempt to make their classrooms approximate those of CA-matched, nonhandicapped students. Under more normalized circumstances, it is likely that appropriate social behaviors will be emitted, which should lead to the concomitant decrease of aberrant behaviors.

There is another set of variables that could be labeled ecological "pollutants." Excessive noise, extreme heat or cold, and insufficient lighting are likely to have deleterious effects on learning and behavior. In the current times of fiscal cutbacks in education, urban decay and school deterioration, and energy crisis, many of these ecological pollutants will be present. Although these variables have not been systematically studied, many of the ways to remediate these problems are apparent, i.e., provide heat, insulate against sound, etc., but may be unobtainable because of limited funds. Still, the teacher should be aware of these variables; their potential effects on behavior; and remediate them whenever possible.

Curriculum

Component 4 presents an analysis of curriculum variables which may be modified in order to reduce aberrant behavior. Although the primary behavioral strategy to eliminate problem behaviors has been to manipulate consequence events, an increasing number of studies have shown a covariation between the type of task engaged and the amount of aberrant behavior displayed (Gaylord-Ross & Weeks, Note 4; Schroeder & Humphrey,

Note 6). Schroeder and Humphrey found consistently high rates of self-injury during fine motor activities in a severely retarded, adult female. Gaylord-Ross and Weeks in a case study showed the frequency of self-injury to be high when sorting buttons and low when assembling puzzles.

Besides examining the correlations between tasks and aberrant behaviors, a curricular approach asserts that an important way to reduce problem behaviors is through skill building activities. That is, given the limited skill repertoires of severely handicapped persons, it is quite likely that aberrant responses will be emitted due to their social, escape, or intrinsic reinforcement characteristics. As alternative, positively valued behaviors are taught, though, they will compete for appearance with aberrant behaviors. As more and more skill behaviors are established, the probability of occurrence of aberrant behaviors should concomitantly decrease. This competing response notion is similar to the DRI strategy. A curricular approach operates at a more macroscopic level, though. There is no monitoring of an aberrant behavior(s) as a function of positively reinforcing an alternative response as in DRI. Rather, a total educational program is delivered to the student with the expectation that problem behaviors will drop out over time, without the need of special, behavior management programs. In support of the curricular approach, Schroeder et al. (in press) and Voeltz (Note 7) have reported that programs showing the best maintenance of aberrant behavior reductions were those that taught a specific behavioral skill.

The first step in Component 4 (Figure 5) is to observe and document whether problem behaviors appear to be covarying with particular tasks or activity settings. If such a response covariation is found, a series of maintenance-

treatment variables should be considered and enacted when appropriate.

Insert Figure 5 about here

The first variable to consider is the difficulty level of the task(s). Dehn (Note 8) and Weeks and Gaylord-Ross (Note 2) have shown that more difficult tasks tend to lead to aberrant behaviors among severely handicapped children. More specifically, Weeks and Gaylord-Ross found deviant behaviors to occur on error, and not correct, trials. From a reinforcement perspective, Sailor, Guess, Rutherford, and Baer (1968) demonstrated the negative properties of difficult (high error tasks by presenting them contingently upon the appearance of tantrum behavior. This punishment procedure, in combination with presenting easy tasks contingent upon no tantrum behavior, effectively reduced tantrumming.

A number of procedures exist that can eliminate or reduce performance errors. It is possible to fade-in discriminative stimuli in a gradual way so that errorless learning occurs (Sidman & Stoddard, 1966). Correct responses can also be shaped through prompting and reinforcing successive approximations of the terminal behavior. Response chains (Gagne, 1970) can be task analyzed into smaller sequential steps and sub-objectives so that learning proceeds with few errors. Also, a task may be simplified by drawing from a developmental theory (e.g., Piaget, 1970; Gesell, 1974) to indicate an easier task at a lower developmental level. Weeks and Gaylord-Ross (Note 2), for example, constructed easy and difficult discrimination tasks from Gibson's (1969) theory of perceptual development. Finally, tasks may be made easier with more common-sensical guidelines such

as using concrete versus abstract materials or simple versus complex stimuli.

Some empirical support has accumulated for reducing aberrant behaviors through curricular modification. Dehn (Note 8) and Weeks and Gaylord-Ross (Note 2) successfully eliminated problem behaviors through errorless discrimination procedures. Weeks and Gaylord-Ross also reduced aberrant behavior during self-care skill training by using a fine-grained task analysis that minimized errors.

Besides difficulty level, it is possible that the preference value of the task may be correlated with aberrant behavior. Gaylord-Ross and Weeks (Note 4) observed high rates of self-injury when a subject engaged a non-preferred task and low rates with a preferred activity. The preference value of tasks is not always easy to determine, but free-choice techniques have been developed (cf. Striefel, 1974) to infer the relative motivational value of different activities and stimuli.

If it has been established that nonpreferred activities are correlated in time with aberrant behaviors, one obvious tactic would be to drop the task from the student's schedule of activities. The aberrant behavior should then disappear as a function of deleting the task. From a behavioral perspective the maladaptive response was emitted to escape the unpleasant task demands. When the task is removed the escape function of the problem behavior no longer serves a purpose. The task deletion strategy may not be warranted, though, when a critical skill like manual communication or toileting is found to be disliked and correlated with aberrant behavior. It would not be educationally justifiable to stop instruction on such critical skills. In other cases, the deletion strategy may be appropriate.

It may be possible that a task is not preferred because of the low curiosity value of the stimulus materials (Berlyne, 1960). Then, one could redesign the instructional materials to increase their curiousity and preference value so that aberrant behaviors will concomitantly diminish in frequency. The curiousity value of instructional materials and activities could be increased through instituting game-like procedures or heightening the sensory stimulation of the objects. Solnick, Rincover, and Peterson (1977) demonstrated that contingent time-out from stimulating and enriched materials successfully reduced aberrant behavior. Time-out from materials and activities that were low in curiousity value failed to suppress the same problem behaviors. Teachers, of course, have spent considerable time devising ways to make their instructional materials and activities more interesting. A great deal of effort is still needed from applied researchers to determine more systematic ways that the curiousity value of instructional materials and activities may be increased.

Antecedent events may also set the occasion for aberrant responses. Carr, Newsom, and Binkoff (1977) and Gaylord-Ross and Weeks (Note 4) observed mands, or instructional commands, to lead to self-injurious responses. The mand served as a conditioned aversive stimulus that lead the subject to emit a self-injurious, escape response.

One tactic to reduce aberrant responses that appears to be triggered by mands would be to decrease the rate of presentation of mands (Gaylord-Ross & Weeks). It may also be feasible to continue with a consistent delivery of mands through a paced instruction procedure (Plummer et al., 1977). Also, mands may also be eliminated through desensitization procedures (Ross, Meichenbaum, & Humphrey, 1971).

If none of these specific manipulations of task variables lead to a reduction in the problem behavior, it may be necessary to make a more global examination of the student's curriculum. At the domain or skill cluster level, there may be a disproportionate amount of instructional time given to, for example, motor versus communication training. There has been little formal attention given to the instructional emphasis placed on different domains in the student's goal plan (IEP). The content and scheduling of segments of the school day may have yet-to-be-discovered effects on the appearance of aberrant behavior.

It may also be found that skills which lead the person to engage the natural environment in a self-initiated manner may produce significant decrements in aberrant behavior. For example, Guess et al. (1976) have identified control and self-extended control terms as those which enable the person to act upon and manipulate the environment. Guess, Keogh, and Sailor (1978) and Stokes and Baer (1977) have asserted that language terms and phrases that are likely to be reinforced in natural settings will promote the generalization of language to other situations. It may also be likely that skills receiving reinforcement in natural settings may decrease the probability of occurence of aberrant behaviors (Gaylord-Ross, Note 9).

Punishment

Component 5 deals with the administration of punishment in order to suppress aberrant behavior. Punishment is defined as the contingent application of a consequence that leads to the deceleration of the target response. Punishment can involve the contingent presentation of a negative consequence, e.g., an aversive stimulus, or the contingent removal of a positive consequence. In either case the contingency procedure must result in a deceleration in the

operant behavior.

The punishment component appears last in the decision model for ethical and programmatic reasons. Ethically, it is felt that in most cases punishment can only be justified if a number of more positive approaches (DRI, ecological, and curricular interventions) have already been attempted and evaluated. When a number of positive approaches have been tried and have failed to significantly reduce the aberrant behavior, certain types of punishment procedures may be implemented. The type of punishment used may be circumscribed by regulations at the local site. Certain negative consequences like contingent electric shock are more commonly banned from use. Other aversive stimuli may be considered repugnant to staff members even if there is no legal stricture precluding their use. The critical point is that punishment is viewed as a last resort in a series of attempts to suppress aberrant behavior. In too many cases punishment has been the first procedure that is used. The hasty application of punishment leads to a "reactive" therapeutic strategy that fails to deal with the source of the behavior problem. Without a primary emphasis given to skill building, it is likely that punishment programs will be overused in reacting to each new aberrant behavior that appears and reappears.

The first step in Component 5 is to decide whether a punishment approach is appropriate and likely to succeed with the particular student. If an affirmative judgement is made, punishment is not immediately instituted. First, it should be ascertained that a sufficient density of positive reinforcement is being delivered to the student. If there is not an acceptable density of positive reinforcement, a separate treatment phase

should be instituted with a DRI or DRO procedure. Azrin, Kaplan & Foxx (1973) used this design of following baseline with DRI in order to eliminate self-stimulatory behavior. DRI had a moderate but incomplete effect in reducing the problem behavior. The DRI phase was then followed by an overcorrection plsu DRI treatment condition. That is, correct behaviors received contingent positive consequences and self-stimulation resulted in 20 minute overcorrection periods. It was found that overcorrection plus DRI successfully reduced the problem behavior to a near-zero frequency level. Component 5 thus recommends a conjunctive schedule of a punishment procedure paired with a DRI or DRO procedure. The functional or controlling effect of each procedure can be evaluated with a reversal design examining interaction effects (Hersen & Barlow, 1976, pp. 213-224). For example, the design could develop in the following manner: A (baseline) -B (DRI) -A -B -BC (DRI + Overcorrection) -B -BC. The latter four phases reverse the effect of overcorrection in the presence of DRI.

Insert Figure 6 about here

If a DRI or DRO procedure has not singularly reduced the problem behavior to a near-zero level, it becomes necessary to select a specific punishment procedure. There are a number of techniques that have demonstrated functional control over aberrant behaviors (Baumesiter & Forehand, 1973). The criteria for the selection of a specific procedure has yet to be adequately investigated. If the selection is based on the least aversive technique, time-out or reinforcement withdrawal would probably be chosen. Time-out contingently removes all potential positive consequences from the individual by typically secluding the person in a time-out area or booth (for a fuller

discussion of time-out procedures see Schroeder et al., in press). Reinforcement withdrawal takes away a single positive consequence from the person, e.g., a token or social interaction, contingent upon an aberrant response. A variant of reinforcement withdrawal that has been shown to eliminate self-injurious behavior is visual screening (Lutzker, 1978). Visual screening contingently blocks visual stimuli for a fixed period of time.

A more intrusive set of procedures--overcorrection and contingent restraint--involve the exertion of manual control over the person. The overcorrection of self-stimulatory and self-injurious behavior (Azrin et al., 1975) entails putting the person through a series of arm or head movements. Contingent restraint merely involves holding the arm(s) or other body part in a fixed position for a given time interval (Gaylord-Ross, Note 6; Schroeder, Peterson, Solomon, & Artley, 1977). Foxx and Azrin (1973) originally considered overcorrection an educative procedure that taught alternative behaviors. Many persons, though, have resisted the manual control of the overcorrection exercise as if it was an aversive experience (Gaylord-Ross, Note 10; Rollings, Baumeister, & Baumeister, 1977). Foxx (1977) has more recentlyacknowledged the punishing characteristics of overcorrection.

Finally, there exist a number of other negative consequences that have been shown to eliminate the aberrant behavior of severely handicapped persons. Some of these procedures include contingent electric shock (Lovaas & Simmons, 1969), aromatic ammonia (Tanner & Zeigler, 1975), and contingent imitation (Kauffman, LaFleur, Hallahan, & Chanes, 1975). The actual punishment procedure selected should be based on: (a) the individual characteristics of the student and the behavior problem, (b) the likelihood of the program being

carried out in a consistent manner, (c) the probability of successfully eliminating the behavior, and (d) the ethical and legal legitimacy of using a specific procedure. If one punishment procedure has been implemented and has failed to eliminate the problem behavior, it may be decided to try another punishment procedure (Figure 6). Whenever a punishing stimulus is presented, though, it should be paired with a verbal command such as "no" or "stop that" so that the verbal statement acquires conditioned negative reinforcing properties. Through repeated pairings the verbal command may eventually be able to singularly suppress the aberrant behavior without the continuous presence of the primary aversive stimulus. This development places the student under the verbal control of the teacher and reduces the use of an aversive consequence.

Sequence of the punishment component

It has been argued that punishment should be used as a last resort; only when other, more positive approaches have been tried and proven unsuccessful. While this position is supported on programmatic and ethical grounds, there is one line of research that would argue for the earlier introduction of punishment. Firstly, there are some aberrant behaviors that have such a great frequency and amplitude that only a very intrusive and aversive intervention like electric shock may suppress them (Bucher & Lovaas, 1968). Secondly, and in a related fashion, positive reinforcement and curricular approaches may not take hold until there is an initial suppression of the aberrant behavior. Koegel, Firestone, Kramme, and Dunlop (1976), for instance, found little progress in learning until the contingent slapping of stereotypy was introduced. The slapping procedure appeared to suppress the stereotyped movements so that the subjects could attend to the

discriminative stimuli. It may, therefore, be more advantageous to introduce a punishment procedure earlier in the treatment process than would be indicated by the present sequential model. It is argued, though, that moving more immediately to a punishment approach should only occur under a specific set of circumstances. The class should have attained relatively model conditions so that: there are fairly high rates of reinforcement meted out; the classroom ecology meets most of the criteria of Component 3; a field tested, sequential curriculum has been implemented and evaluated in the classroom. When this level of programming sophistication has been reached it may be possible to procede more quickly to Component 5. Even under these circumstances, the varying modules of Components 2 - 4 should be considered and evaluated in checklist fashion before proceeding to Component 5. If a greater than expected number of aberrant behaviors begin to appear among students, it may be wise to evaluate the optimality of the classroom program along the criterion variables delineated in Components 2 - 4.

Summary

A sequential-decision model was advanced for the treatment of aberrant behavior. The model suggests that teachers and other practitioner proceed in a particular sequence when treating problem behaviors. Table 1 summarizes the maintenance and treatment variables in terms of antecedents and consequents. There is a need for empirical testing of the model to confirm its validity. It may be found that the order of components in the model is not optimal. At this juncture, it is strongly advised that behavioral procedures be tried first and punishment techniques last. The ordering of ecology followed by curriculum is not so fixed and may be reversed when circumstances dictate. It may also be necessary to implement two components simultaneously, e.g.,

ecological and curricular. The seriousness of the behavioral problem may not permit implementation in a linear, sequential fashion. A multiple component treatment package would, of course, not indicate which component had gained functional control over the aberrant behavior. Thus, there exists the need for empirical verification of the decision model and clarification of what modifications should be made to optimize its effectiveness.

Insert Table 1 about here

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Table 1

Classification of Maintenance and Treatment Variables Affecting Aberrant Behaviors

Antecedent Event		Consequent Event	
Maintenance	Treatment	Maintenance	Treatment
Ecological		**Behavioral**	
Crowding	Increase Space Partition space	Positive Reinforcement	Extinction
Objects	Toys, Prosthetics Play Training	Negative Reinforcement	Putting through paced instructions
Face Validity	Decor Group Instruction Functional Objects	Density of Reinforcement	DRI, DRO Noncontingent reinforcement
Pollutants	Regulate: Heat Lighting Noise	**Punishment**	
			Reinforcement
			Withdrawal
Curriculum			Timeout
Difficulty Level	Errorless, Shaping Task Analysis Developmental Level		Contingent restraint
Boring	Delete, Game, Materials		Overcorrection
			Other aversives
Mand	Rate, Embed, Desensitize, Change		
Curricular Domain	Goal Plan, Class Schedule		

Figure Captions

Figure 1. A five-component, sequential-decision model for the treatment of aberrant behavior.

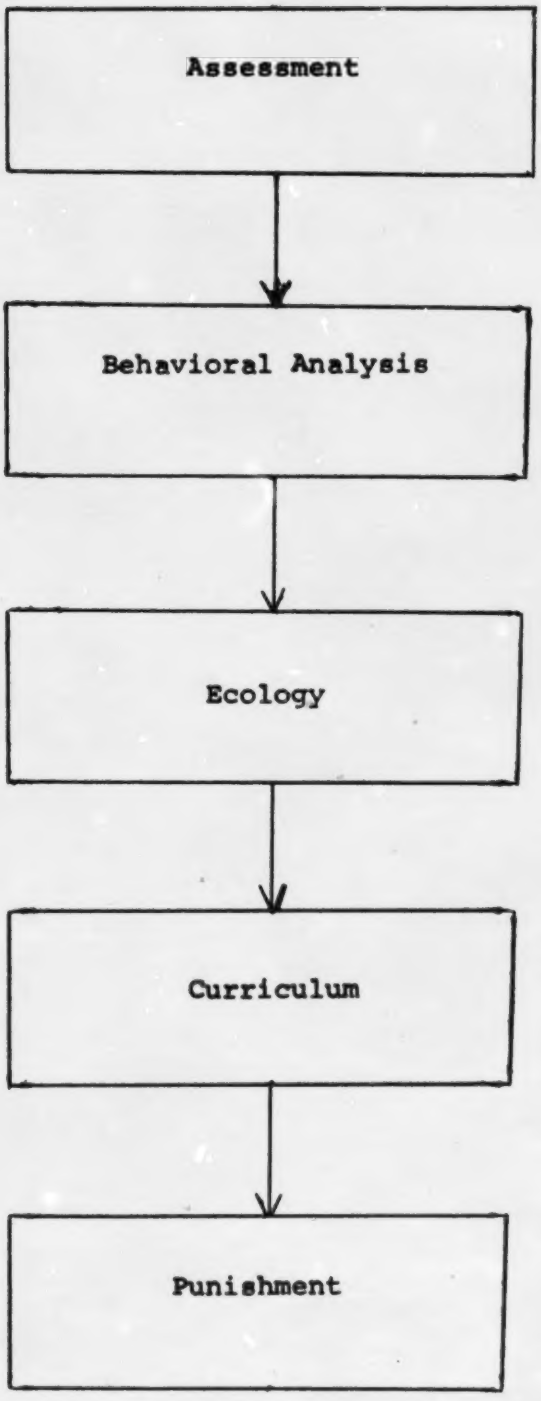
Figure 2. Flow chart of the Assessment component. Circles indicate stop, start, or exit steps. Diamonds indicate a decision or branching step, e.g., "yes," the behavior problem is clinically significant or "no," the behavior is not maintained by medical factors. A rectangle states the procedure to be implemented, e.g., collect quantitative data or institute a medical intervention.

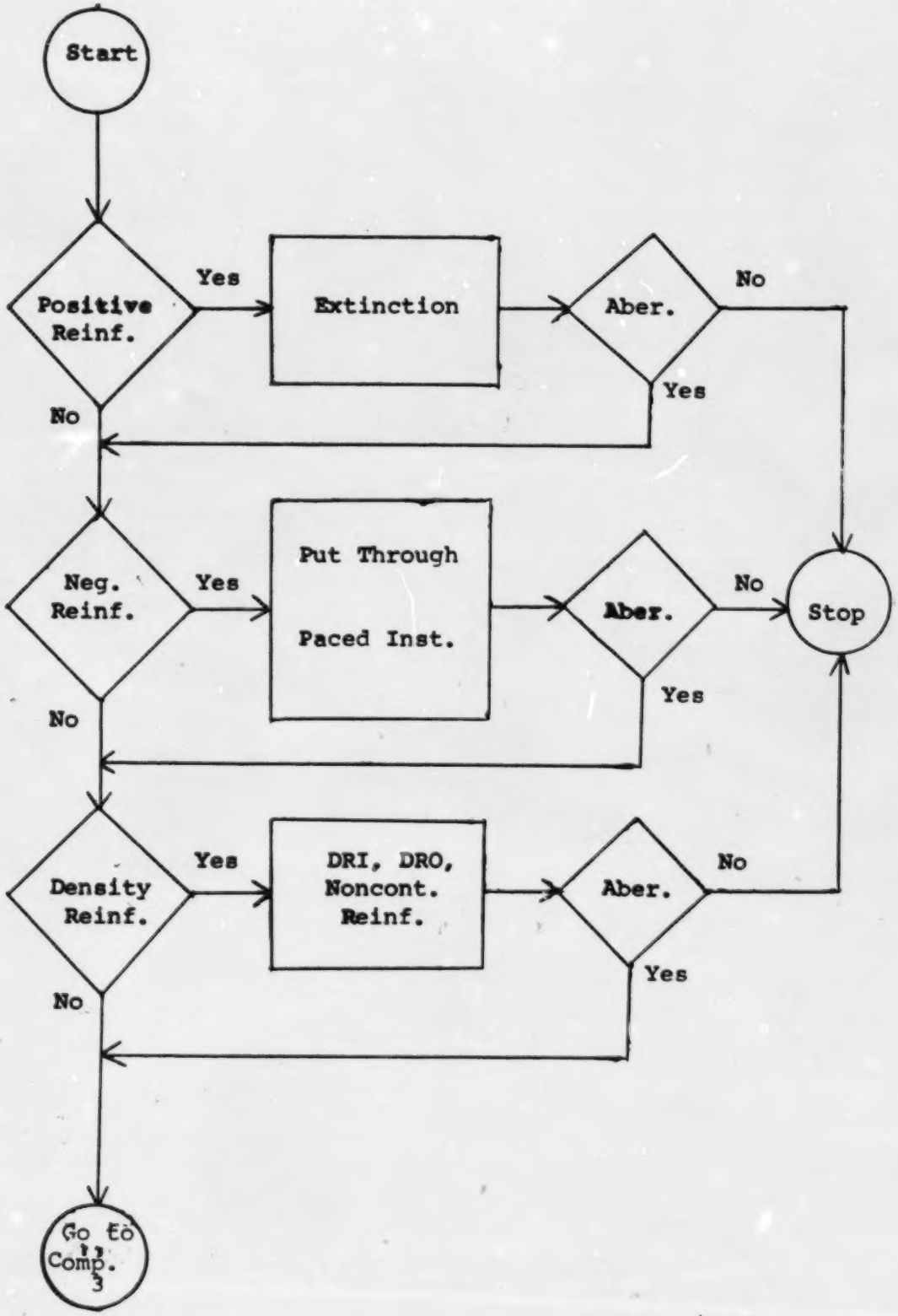
Figure 3. Flow chart of the Behavioral Analysis component. The aberrant diamond evaluates whether a significant amount of problem behavior remains after the intervention has been implemented. "Yes" there is still a significant amount of behavior and gives direction to the next maintenance variable to be considered. "No" means the behavior has been reduced to a near-zero level. The stop module declares that the special program can be terminated or faded out.

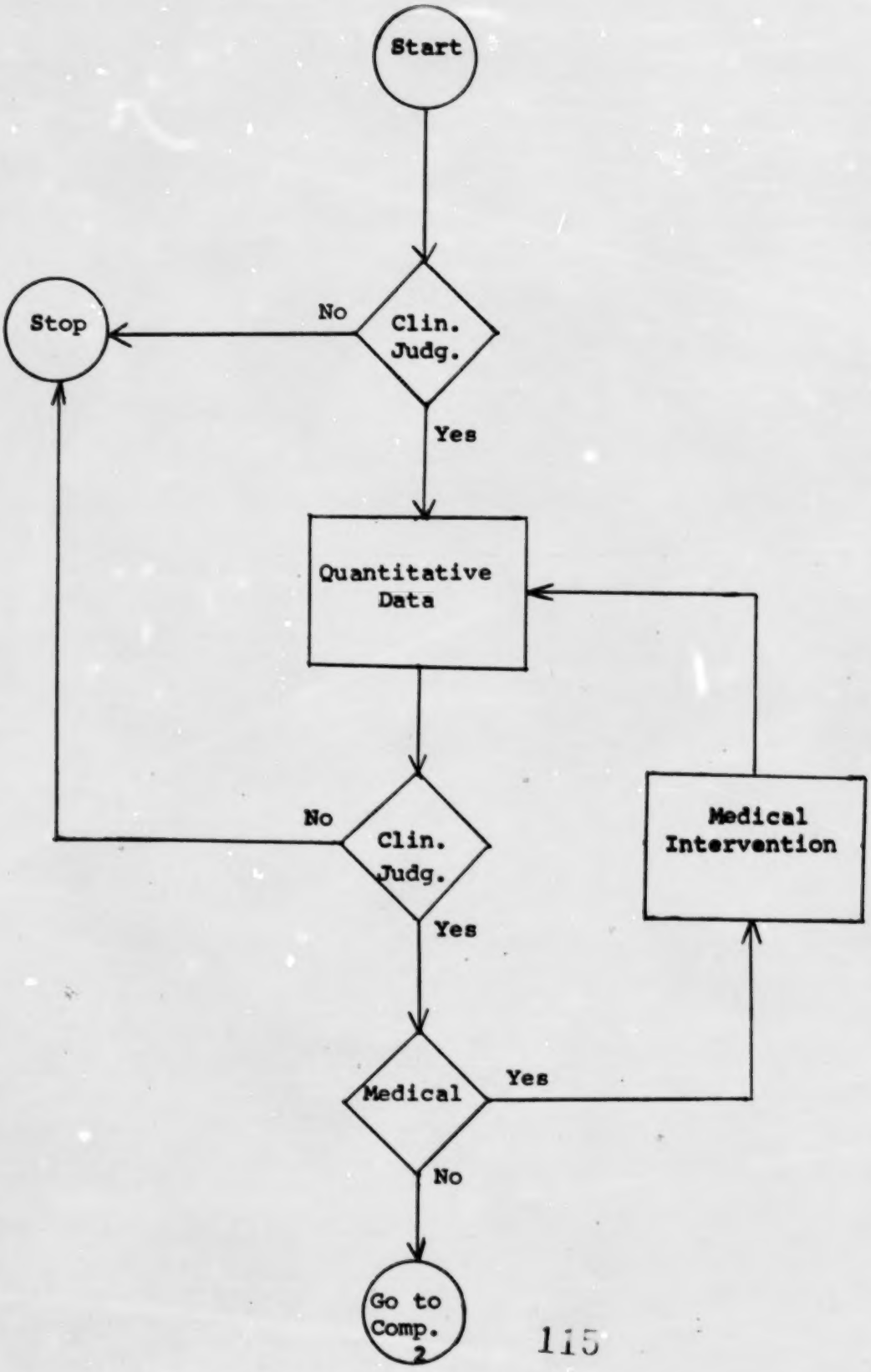
Figure 4. Flow chart of the Ecology component.

Figure 5. Flow chart of the Curriculum component.

Figure 6. Flow chart of the Punishment component.


Assessment
Behavioral Analysis
Ecology
Curriculum
Punishment


Start
Positive Reinf.
Yes
Extinction
Aber.
No
Yes
No
Neg. Reinf.
Yes
Put Through
Paced Inst.
Aber.
No
Stop
Yes
No
Density Reinf.
Yes
DRI, DRO, Noncont. Reinf.
Aber.
No
Yes
No
Go to Comp. 3


Start
Stop
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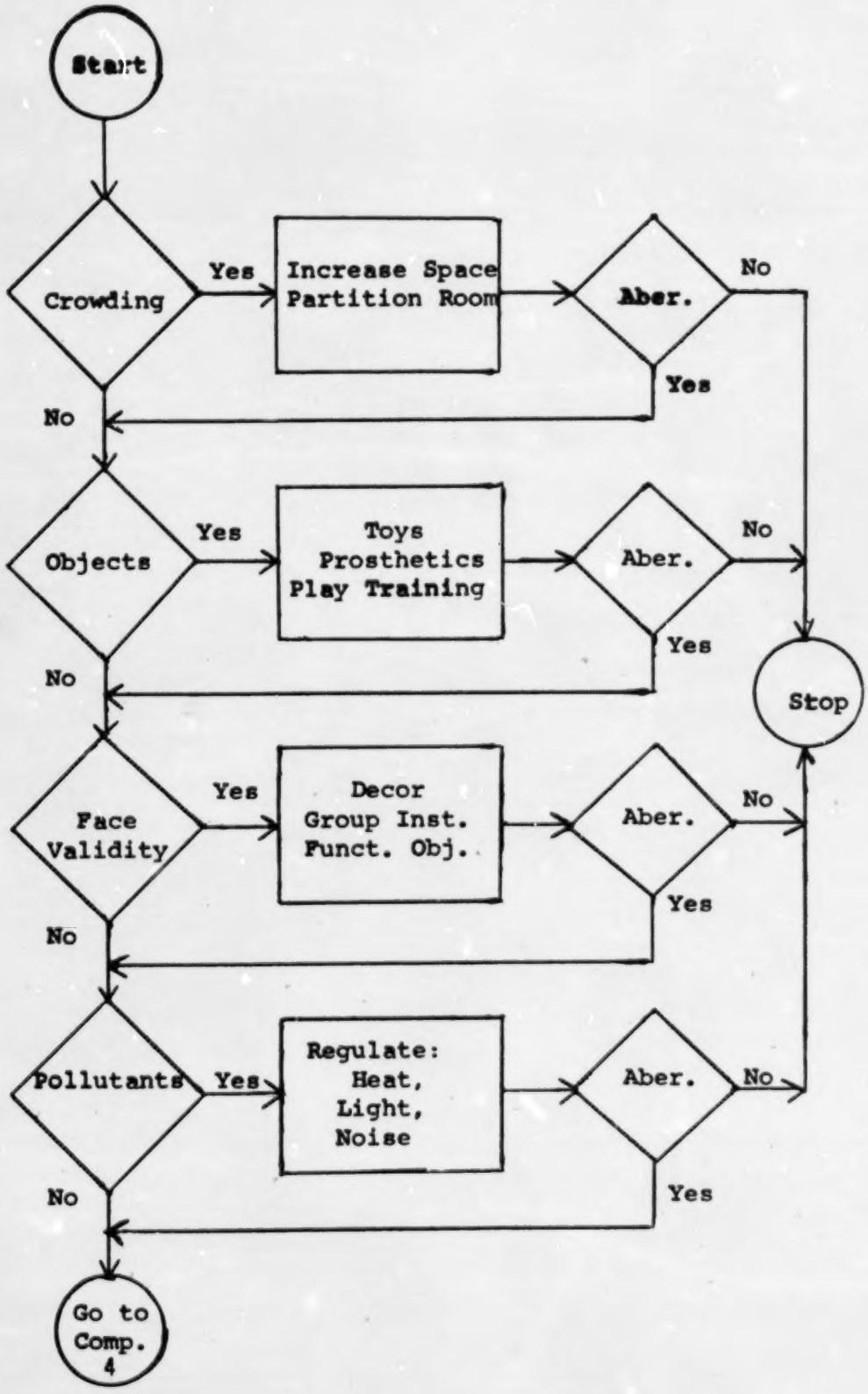
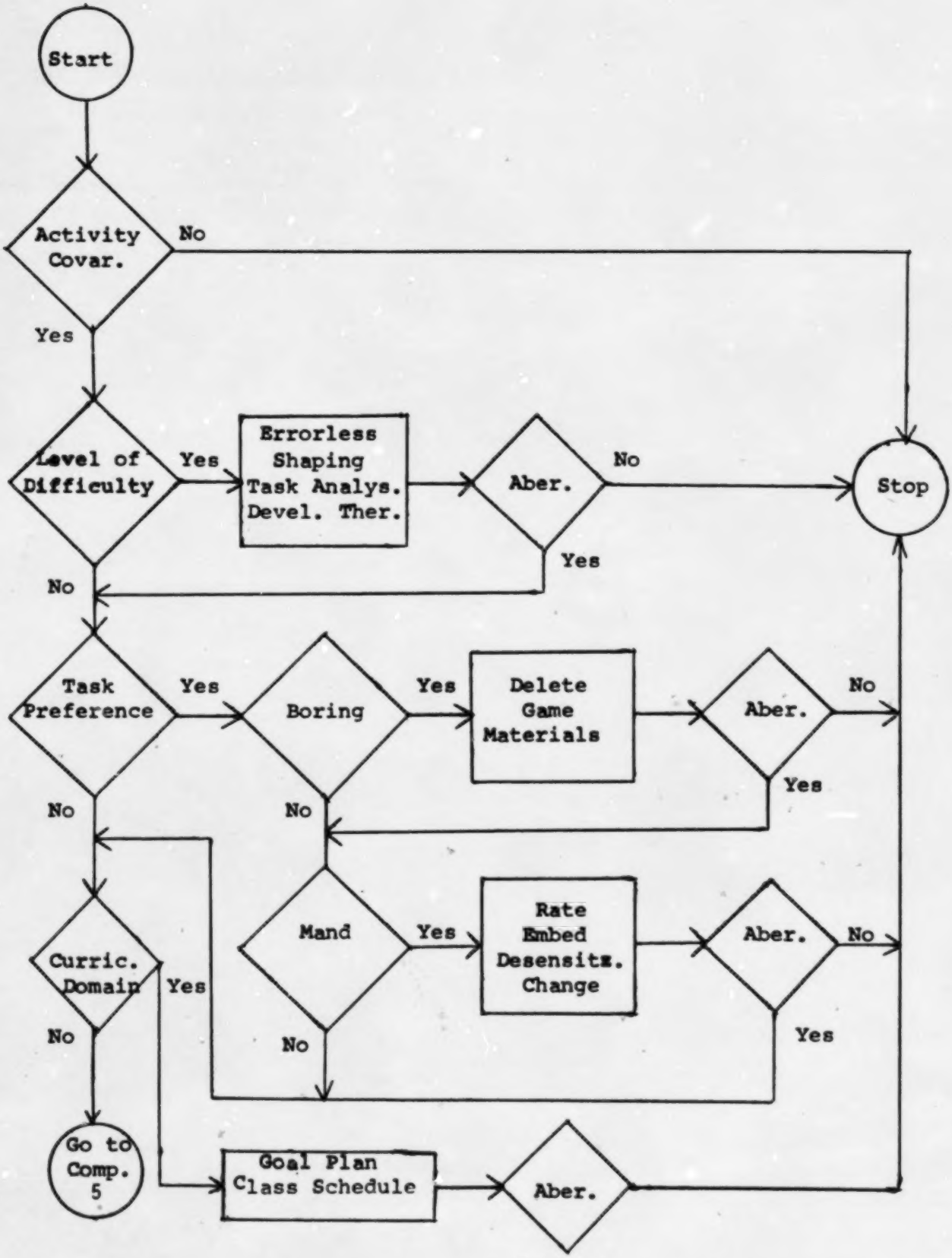
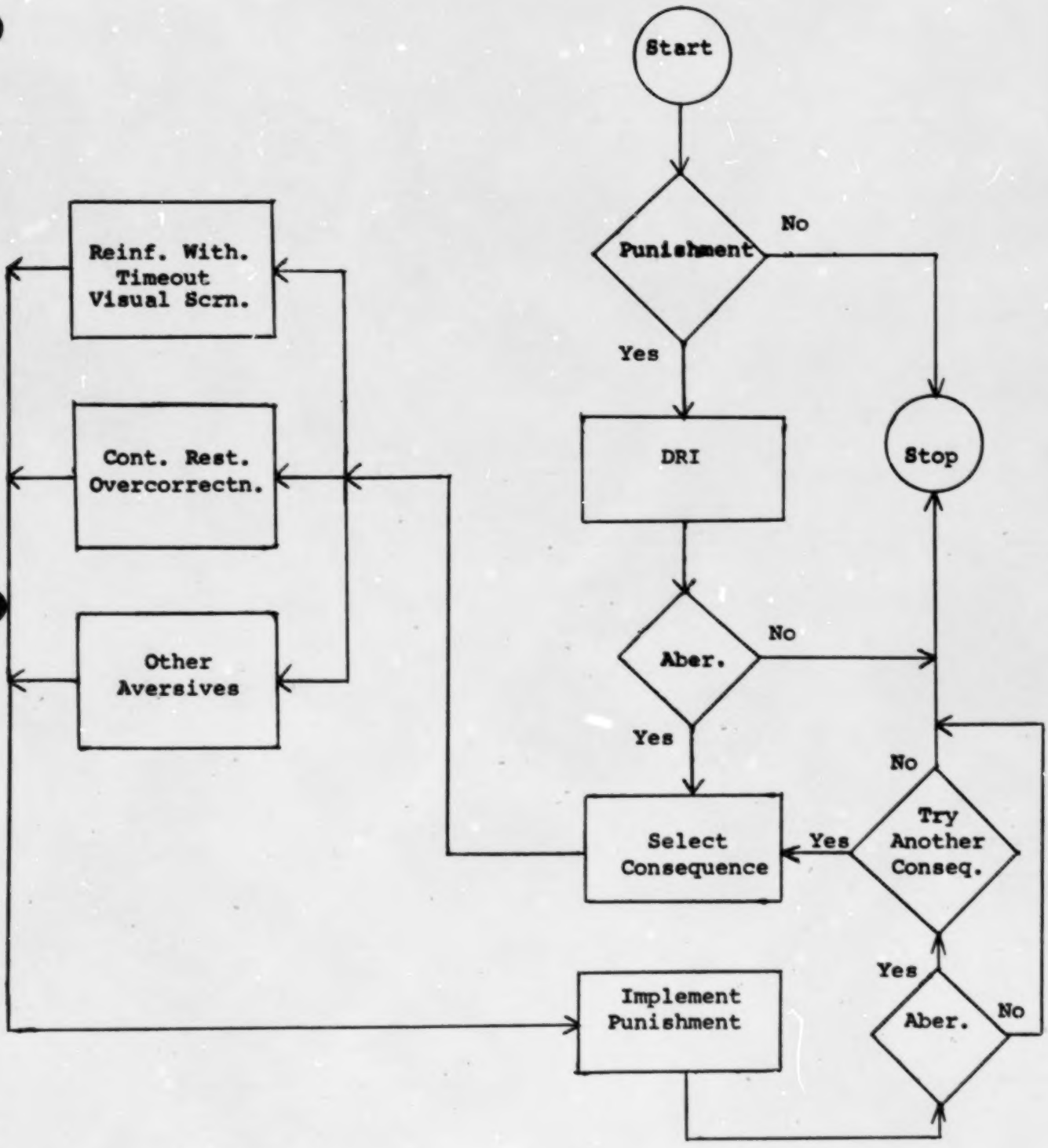
Clin. Judg.
Yes
Quantitative Data
No
Clin. Judg.
Yes
Medical Intervention
Medical
Yes
No
Go to Comp. 2


Start
Crowding
Yes
Increase Space
Partition Room
Aber.
No
Yes
No
Objects
Yes
Toys
Prosthetics
Play Training
Aber.
No
Yes
No
Stop
Face
Validity
Yes
Decor
Group Inst.
Funct. Obj.
Aber.
No
Yes
No
Pollutants
Yes
Regulate:
Heat,
Light,
Noise
Aber.
No
Yes
No
Go to
Comp.
4


Start
Activity Covar.
No
Yes
Level of Difficulty
Yes
Errorless Shaping Task Analys. Devel. Ther.
Aber.
No
Stop
Yes
No
Task Preference
Yes
Boring
Yes
Delete Game Materials
Aber.
No
Yes
No
No
Curric. Domain
Yes
Mand
Yes
Rate Embed Desensitz. Change
Aber.
No
Yes
No
No
Go to Comp. 5
Goal Plan Class Schedule
Aber.


Start
Punishment
No
Yes
Reinf. With. Timeout Visual Scrn.
Cont. Rest. Overcorrectn.
Other Aversives
DRI
Stop
Aber.
No
Yes
No
Try Another Conseq.
Yes
Select Consequence
Yes
Aber.
No
Implement Punishment

The Relationship Between Task Difficulty and Inappropriate Behavior In Severely Retarded Children

Marian Weeks

Paper presented May 17, 1978 at
the 102nd Annual Meeting of the
American Association on Mental
Deficiency

Teachers of severely retarded children are often faced with the task of eliminating aberrant behavior emitted by their students. The usual method for reducing aberrant behavior involves the administration of new consequences to a particular response class. Examples of procedures in which such response contingent consequences are appled include positive reinforcement of an incompatible behavior, time out, overcorrection, and electric shock. However, some of these procedures, particularly overcorrection and electric shock, may be extremely emotionally upsetting to both the child and to the individual responsible for administering the procedure. If a means existed for reducing the aberrant behavior other than these procedures, substantial distress on the part of the child and teacher may be averted.

Investigators such as Carr (1977) reported that aberrant behavior appears during situations in which demands are placed on the child. Carr suggested that the aberrant behavior may be maintained by negative reinforcement. For example, a teacher's demand that a child perform a particular task may be an aversive stimulus. By emitting the aberrant behavior, the child is able to terminate the demands and also avoid performing the task.

Other research has indicated that while demands made in some situations may cause a child to emit aberrant responses, the same demands made in different situations do not result in such behavior. Last year at AAMD, Gaylord-Ross reported on a sixteen-year old girl who bit herself when demands were made that she perform a sorting task, a task which she apparently found aversive. However, when demands were made that she put puzzles together, a task which she apparently did not consider aversive, little or no self-injurious behavior occurred.

This research suggests that if some way could be found to reduce the aversiveness of a task, the child may be less likely to emit aberrant responses when the teacher presents demands that the child complete the task. One factor which may

contribute to the aversiveness of a task is the extent to which the task is difficult for the child. Thus, if the difficulty of a task were to be decreased, there may be a concomitant reduction in aberrant behavior. To investigate whether aberrant behavior varies with task difficulty, a subject was presented with tasks of varying difficulty, and the amount of aberrant behavior emitted during each task was measured.

Method

Subject

The subject was a thirteen-year-old girl, who had been diagnosed severely mentally retarded with autism. She was attending a special day school for retarded and emotionally disturbed children. At various times during the day, she was observed to bite either her index finger or her left wrist.

Procedure

The subject was first presented with five sessions of a baseline. Each session was twenty minutes in length. During baseline, tasks which were normally presented to the subject in her classroom, such as puzzles, were placed in front of her. The trainer, however, did not interact with her in any way. An interval sampling procedure was used to record self-injurious behavior. The trainer recorded whether or not a finger or wrist bite occurred within a thirty-second interval.

After baseline, the subject was presented with an easy task, which consisted of a two-choice discrimination. Figure 1 contains the stimuli which were used in the various tasks. Two 5 x 8 cards containing the stimuli were placed in front of the subject, and she was given the instruction "Point to the correct card." If she made a correct response, she was reinforced with praise and an edible. If she made an incorrect response, she was told, "No, that's wrong." If she did not respond within twenty seconds, the cards were removed. A ten second

intertrial interval followed the subject's choice of a card. The easy task was presented for six sessions.

The easy task was followed by three sessions of a second baseline. After this baseline, the subject was presented with a difficult discrimination task which involved the same procedure that had been used during the easy task. In other words, the subject learned the discrimination by trial and error. The difficult task, which was presented for seven sessions, was followed by another baseline.

The subject was then presented with a second difficult discrimination task. However, unlike the previous difficult task, this discrimination was taught by an errorless learning or fading procedure. Terrace (1966) had successfully used such a procedure to teach pigeons a two-choice discrimination. Since then, Sidman and Stoddard (1966) and, more recently, Schriebman (1975) taught severely retarded and autistic children relatively difficult discriminations using such a procedure. Figure 2 contains the stimuli which were used in the fading procedure. During fading, the subject was presented with the stimuli of a particular step until she responded correctly on five consecutive trials. The subject was then presented with the stimuli of the next step. If she made an error, whe was moved back to the previous step.

Results

The graph in Figure 3 indicates that no self-injurious behavior occurred during any baseline session.

Furthermore, the subject did not emit any self-injurious behavior during the easy task. She learned the easy discrimination in the first session, having reached criterion after making only six errors.

However, during the difficult task taught by trial and error, the subject bit herself several times. The points on the graph in Figure 3 represent the percent

of trials, during a particular session, in which self injurious behavior occurred. For example, in the first session of the difficult task taught by trial and error, the subject bit herself during 40% of the trials. Also, for the first five sessions of this condition, she made errors on approximately 50% of the trials and developed a position preference by responding only to the card on her right side. However, she reached criterion during the sixth session. Not only had the discrimination been successfully learned but no self-injurious behavior occurred during this session. During the seventh session, the subject made no errors and also did not bite herself.

The subject made very few errors during the difficult task taught by fading. She made only one error in the first session, two errors in the second session, two errors in the third session, and no errors in the last two sessions. Furthermore, she emitted relatively little self-injurious behavior during this condition.

The difficult task taught by trial and error contained the highest percent of trials in which finger or wrist biting was observed. Self-injurious behavior occurred during 13% of the trials of this condition. However, self-injurious behavior was emitted during only 4% of the trials of the difficult task taught by fading, and self-injurious behavior did not occur at all during the easy discrimination task.

Furthermore, it was during the difficult task taught by trial and error that the subject made the greatest amount of errors. She made errors on 40% of the trials of this condition compared to only 1% of the trials of the difficult task taught by fading and only 3% of the trials of the easy task.

All of the self-injurious behavior occurred during the ten second intertrial interval. Furthermore, 87% of the self-biting followed an incorrect response. In other words, almost all the finger and wrist biting was emitted after the subject had been told that she had made an error.

Discussion

The finding that the highest amount of aberrant behavior occurred during the task in which the subject made the greatest number of errors, suggests that such behavior may vary with the difficulty of a task. This conclusion is also supported by the finding that once the subject reached criterion and no longer made errors, she almost never bit herself.

These findings have important implications for teachers of severely retarded children. First, by designing a curriculum so that the child is taught by a fading or errorless learning procedure, the teacher may reduce the amount of time required by the child to learn a skill. In addition, if the child is taught by errorless learning, the number of errors the child makes will be minimized. By keeping the number of errors to a minimum, the teacher may be able to decrease the amount of aberrant behavior emitted by the child.

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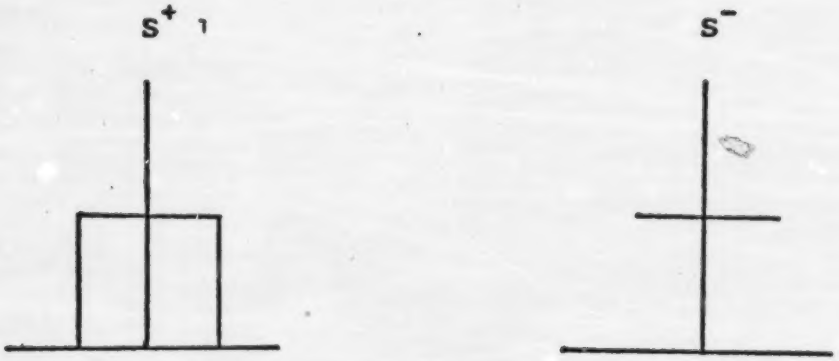
Figure 1. Discrimination Tasks

EASY TASK



DIFFICULT TASK: TRIAL AND ERROR

DIFFICULT TASK: FADING

Figure 2. Fading Steps.

FADING STEPS

S^+

S^+ did not change during fading.

Fading Steps for S^-

Step 1. Step 1 consisted of a blank card.

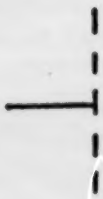
Step 2. . . .

Step 3. — — —

Step 4. ——

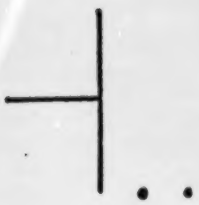
Step 5.

Step 6.

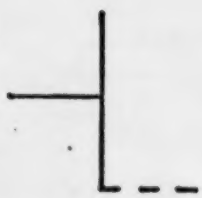


Step 7.

Step 8.

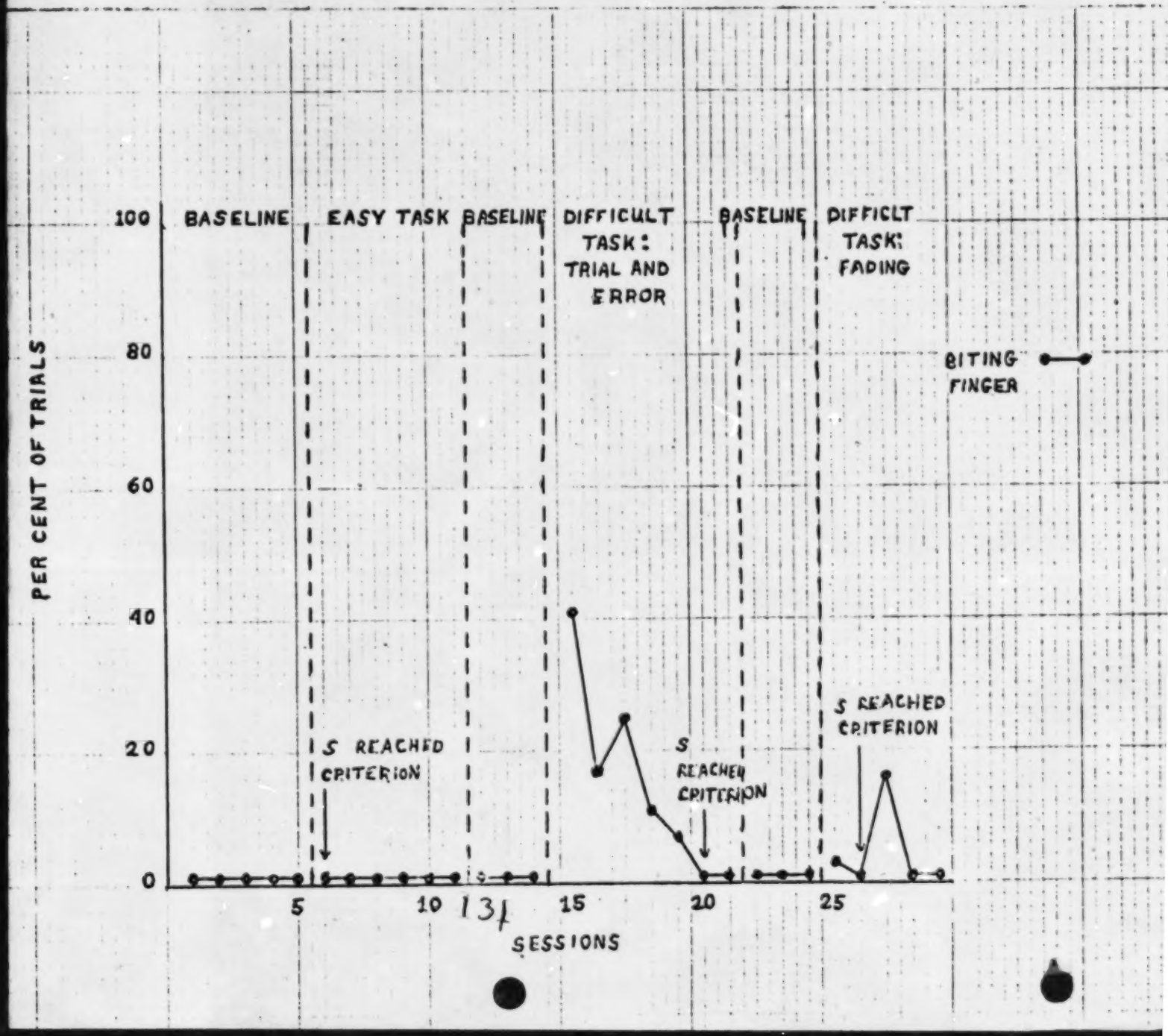


Step 9.



Step 10.

Figure 3. Percent of trial in shich self-injurious responses occurred.


BASELINE
EASY TASK
BASELINE
DIFFICULT TASK: TRIAL AND ERROR
BASELINE
DIFFICLT TASK: FADING
BITING FINGER
S REACHED CRITERION
S REACHED CRITERION
S REACHED CRITERION
PER CENT OF TRIALS
100
80
60
40
20
0
5
10
15
20
25
SESSIONS